Handbook for Pressmen

Fred W. Hoch

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With an Introduction by
The Honorable A. E. Giegengack
Public Printer of the United States

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Foreword

Those of us who have the progress of the printing industry at heart must of necessity encourage the adoption of every essential medium dedicated to this end. When a book of real value has been written for the purpose of helping those in the industry, we should at least read it, analyze its contents, and, if we consider it helpful to those for whom it is written, recommend its use.

Most problems in the field of practical printing can be solved through education. Our most efficient journeymen scan trade papers or magazines to keep in close contact with innovations and improved processes. They seek methods of overcoming both new and old difficulties encountered in the pressroom. Vocational and industrial schools teach apprentices ways and means to minimize these troubles, and textbooks have been written on the subject. Most of them are good, few of them complete. No book yet published is more comprehensive than the "Handbook for Pressmen," which deals not only with presswork problems but also those things the pressman should know about the myriad other processes of reproduction in the graphic arts industry. This reference book should be a valued help to schools, Craftsmen's Clubs, trade-association meetings, and to the individual apprentice receiving pressroom training.

Pressmen know that their problems are seldom identical. It is the successful craftsman that is able quickly to recall a method to overcome his difficulties as soon as they occur. The man who can remember the greatest number of answers is generally the most successful in his trade. The "Handbook for Pressmen" is a reference book that will enable the pressman to help himself in solving those difficulties incidental to modern printing.

Most of the educational effort put forth in the graphic arts industry has been on subjects other than presswork. The need for a book on this subject has long been felt both by those active in the trade and those who wish to learn. The contents of this volume, as noted by the index, are quite inclusive of those things a good pressman should know.

FOREWORD

The author, Fred W. Hoch, has an international reputation built upon a foundation of experience. He is known for his untiring efforts to help the graphic arts industry to a better understanding of its many production problems. I have had the pleasure of cooperating with him in a number of achievements and I know his constant endeavor to solve practical problems for his fellow man. His previous book, "Standard Book on Estimating for Printers," is accepted by the industry as an authoritative treatise on the mechanics of printing and pamphlet binding as well as on production schedules. His articles published in various trade magazines on estimating, production methods, and comparative costs of competing processes are an indication of his wide knowledge of these subjects. His reputation is based on practical experience in the printing industry.

This reference book should supplement the good work already done by the author. Its contents should be of vital interest and importance to every apprentice, pressman, compositor, teacher, foreman, superintendent, manager, and proprietor who desires to have at his fingertips an authority to be consulted in the practical operation of his shop. This "Handbook for Pressmen" I know to be such a book.

—A. E. Giegengack,
Public Printer of the United States.

Preface

Pressroom delays are always irritating as well as costly—generally coming when the job is in a rush and the customer waiting for copies. Delays are costly because they increase the non-productive time of the department, and, therefore, raise both the cost of the job in question and also the hour selling or cost rate for the coming period. Pressroom delays seldom "cast their shadows before them." For this reason it is best to be prepared for them. Experienced personnel is the best preparation. Those who have not had the benefit of a wide experience may profitably try these suggestions.

Employing printers should appreciate the cause and remedy for each type of trouble encountered. The pressman, too, should understand the cause as well as the remedy for each of his difficulties as they arise. Many a pressman has lost the confidence of his employer because he has been unable to explain satisfactorily why a certain job did not run true to form. It is just as important to know the reason for doing a certain thing as it is to know when to do it.

I have had the opportunity of learning, through field contact work, the dire need of a better understanding of presswork. The change from urban to suburban printing plants has led to individual training for apprentice pressmen. This training is obviously based on the knowledge of the person instructing the apprentice and thus is limited by the experience and ability of the instructor.

This "Handbook for Pressmen" is the culmination of a desire to put between two covers the articles on pressroom problems written for Printing Magazine; The American Printer; The Printing Review of London, England; Postage and the Mail Bag; Advents; The Typothetae Bulletin and other trade papers.

This desire arose from a belief that these articles taken together, form a complete analysis and description of the work of a pressman and that such an analysis is not to be found elsewhere in print.

The descriptions of operations and explanations on letterpress production are the result of actual experiences of the author. The historical references and industrial standards are gathered from reliable sources of information. It is hoped this reference book will be of real assistance to the pressman confronted with a problem or faced with the necessity of instructing an apprentice.

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HANDBOOK FOR PRESSMEN

DEFINITION OF PRINTING

Printing is the pulling of an impression from a form consisting of plates or multiplicity of types that have the ink applied and controlled with either a roller, squeegee, doctor blade or inked ribbon.

FRED W. HOCH

Chapter 1

Methods of Line-up

The fundamental principles of line-up are very simple. When thoroughly understood and applied these principles will result in greater efficiency in the composing room, pressroom and bindery. Some printers are thoroughly familiar with all branches of their industry and yet do not use the simple methods of line-up that bespeak economy.

Many improved devices for facility in line-up are now being sold to the industry. These various line-up tables are doing a great deal toward eliminating waste in the industry. In covering these principles we will consider only the straight-edge, rule, pencil, and knife as tools as they can be used with or without the line-up table.

The expression "line-up the sheet," is a misnomer. It is the form that is "lined up." Surely the form position is of utmost importance and if the gripper and side guide margins are correct the balance of the sheet will cut or fold properly if the form is properly aligned.

Squaring the Sheet

Very often the four edges of a sheet are not at 90 degree angles to one another. It is obvious that a sheet of this kind is not square. Sometimes sheets trimmed on all four sides will show this discrepancy. The condition may be due to the back or side guage of the cutting machine which is not at right angles with the cutting knife. At any rate, the first thing to do in line-up is to square the sheet. For the purpose of explanation we shall exaggerate the condition to make clear the method. (See illustration 1.)

In label work or any kind of commercial printing that runs multiples of units which must later be cut apart there is a serious demand for proper line-up. It makes no difference if the units are similar in size or not. The job must be properly lined up in order to get satisfactory results.

The first principle of line-up for similar units such as "moving picture heralds" which are run on a full sheet and then cut apart, is to have all ruled lines the same distances apart as expressed by

the size of the single unit. For example, if the herald is size 7x10½ run 16 up the lines on the sheet would be 7x10½ inches apart. The 7 inches across the 28-inch way and the 10½ inches across the 42-inch way on a 28x42-inch sheet. (See illustrations 2 and 3.)

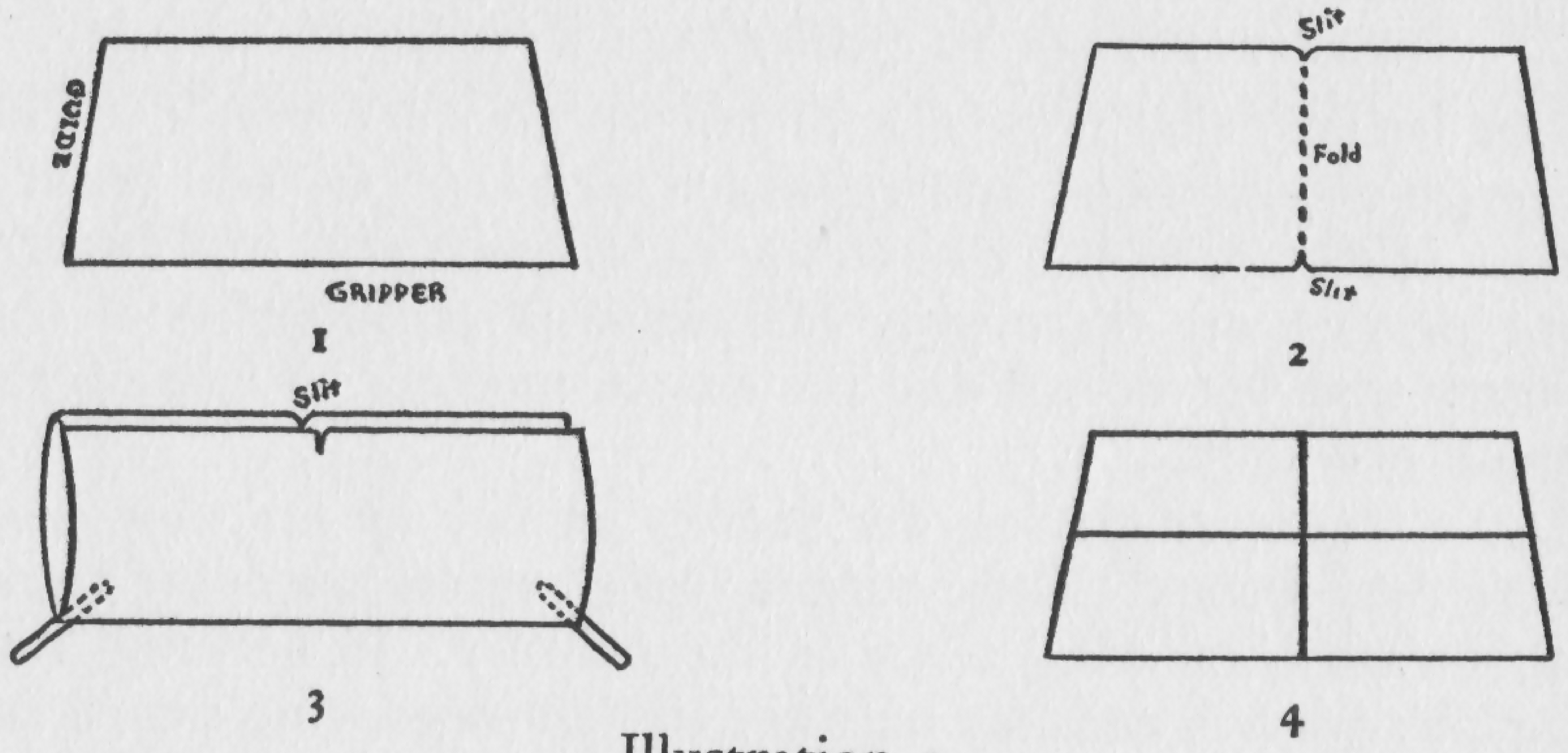


Illustration 1

1. Sheet out of square. 2. Fold sheet in half keeping gripper edge parallel. Then slit folded edge about 2 inches inside the edge. 3. Then fold the sheet the long way by matching the two slits and slit the sheets about 2 inches in the long fold. 4. The folds in the sheet will then be at right angles and square to one another regardless of the differences in the outer edges of the sheet.

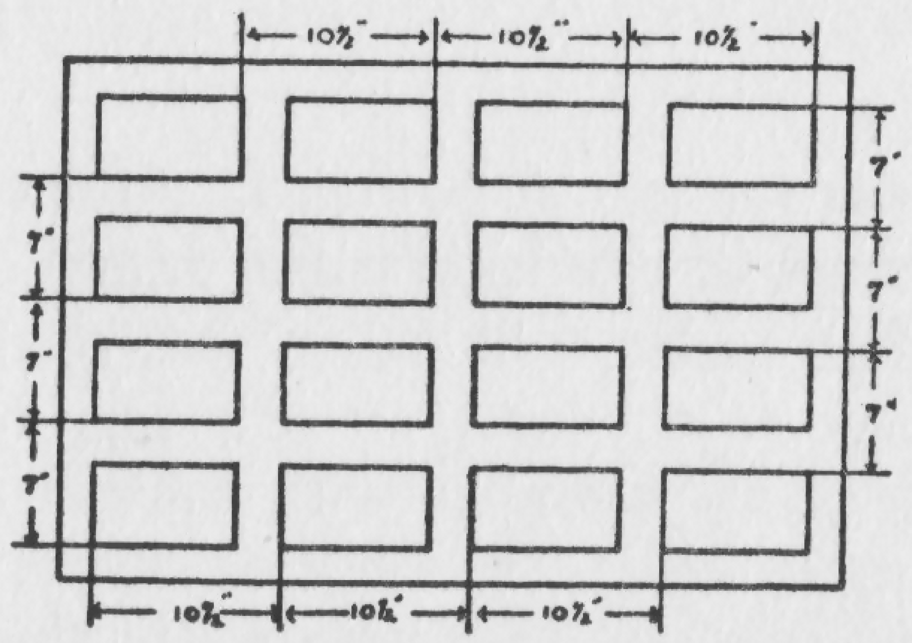


Illustration 2

Diagram showing the measurements made in line-up of the job

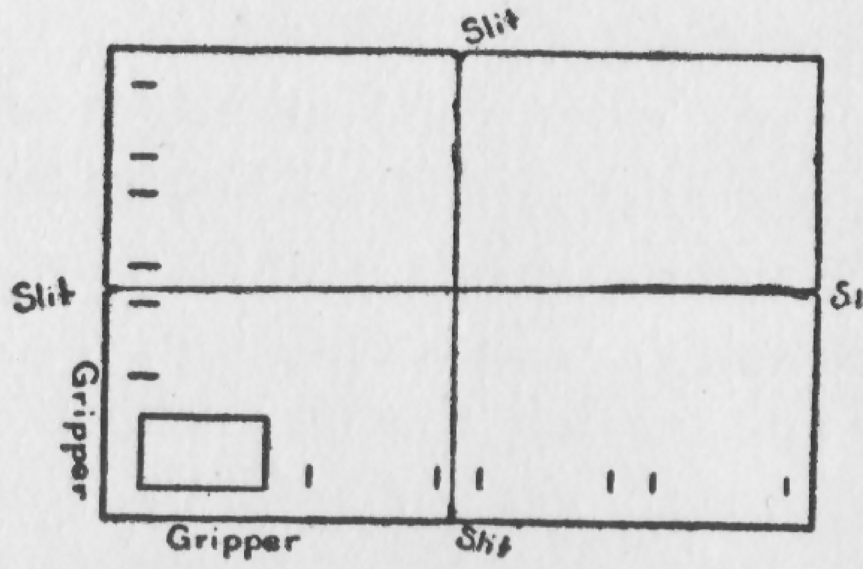


Illustration 3

Diagram showing the key plate and the stabs required to line-up and square up the folded sheet

The first thing to do is to square the sheet. Then get the correct position of the plate in the gripper row nearest the side guide. Then lay a rule across the length of the sheet, measure 10½, 21, 31½, etc., inches from the outside edge of the plate and stab the

sheet each time. Then repeat the operation starting from the inside of the same key plate. Don't make any other measurements on this long side of the sheet for the long side of the plates. Fold the sheet over on the square crease to the back edge and stab the other end of the sheet through the stab marks already placed in the sheet. Then there will be two stab marks in the sheet at extreme edges. Simply place a straight edge or steel rule across these two stab marks on the long way of the sheet, draw a pencil line and all four rows of plates should be exactly between these four sets of lines. (See illustration 4.) Repeat this operation on the

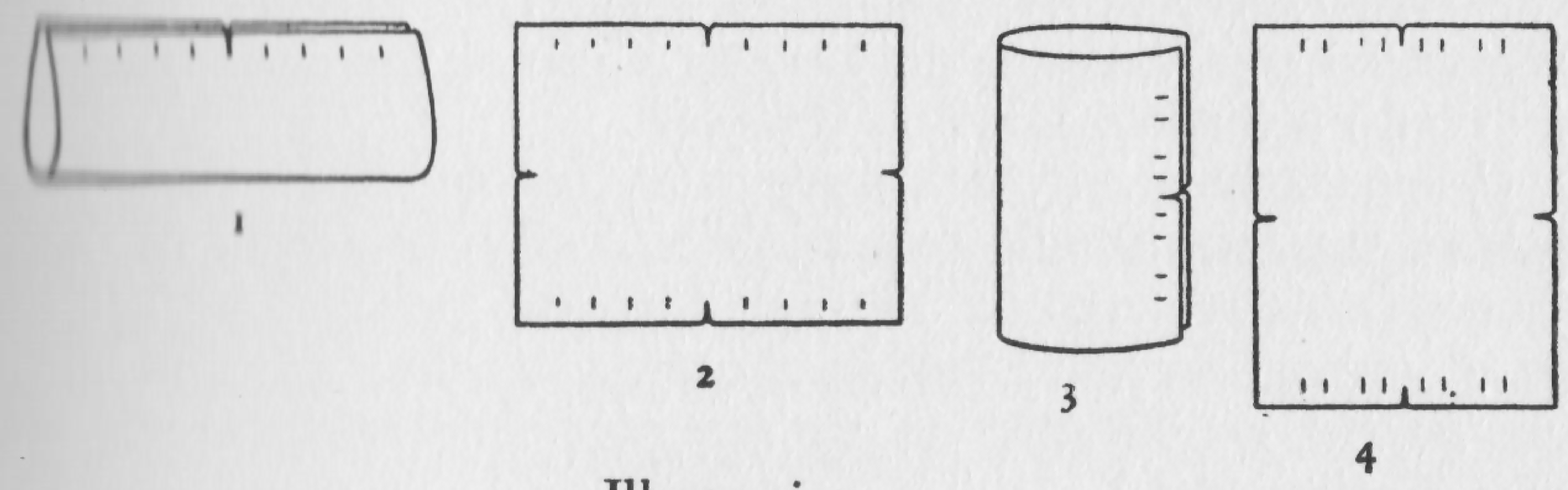


Illustration 4

1. Stab through the gripper edge marks to show on back edge of sheet. 2. Stab marks are guides for pencil lines. 3 and 4. Stab marks on the 28-inch side of the sheet are 7 inches from plate edge to plate edge.

short side of the sheet using the same key plate and stabbing at 7, 14, 21 and 28 inches.

It is always best to use a hard pencil, about a number three, for line-up purposes. This pencil will make a thin line which will show how the plates should be moved. Line-up pencils are generally flattened on one side to a chisel point to permit of a very thin line and careful line-up men keep their pencils that way. Line-up pencils with a chisel point can draw the line closer to the straight edge.

If some plates are larger or smaller than the key plate the pencil lines should act as a guide to show the proper position for irregular plates.

Some printers line-up a job by stabbing the proof at the center of the plate. This method will not give the satisfaction guaranteed by the two line method explained here.

Line-up Book Work

Margins in a book job are determined with the usual allowance of increasing margins starting from the back margin and extending

to the head, front, and tail margin, each getting larger in their proper sequence. The back margin is fixed by the amount of furniture needed to get this desired spacing. The head, tail, and front margins are variable because of the trimming necessary. If it is desirable to allow any excess trim it is generally allowed on the front and tail margins of the book. The standard trim demanded by most binders is ⅛ inch at top and ¼ inch front and tail. On booklets under 4x6 inches the trim is ⅛ inch all around.

Margins for books are dependent also upon the kind of binding used on the job. Sewed or saddle stitched books have different treatment from side stitched books. Side stitched books sometimes require a larger back margin because a part of the back margin is covered by the side stitch in the book.

When the head and back margins are decided upon, the imposition of the form should be manipulated so as to permit the minimum of time required for line-up. Time can be saved in the lock-up of 16-page forms by folding the sheet into four parts and using one-quarter of the sheet to get the proper margins for the job. (See illustration 5.)

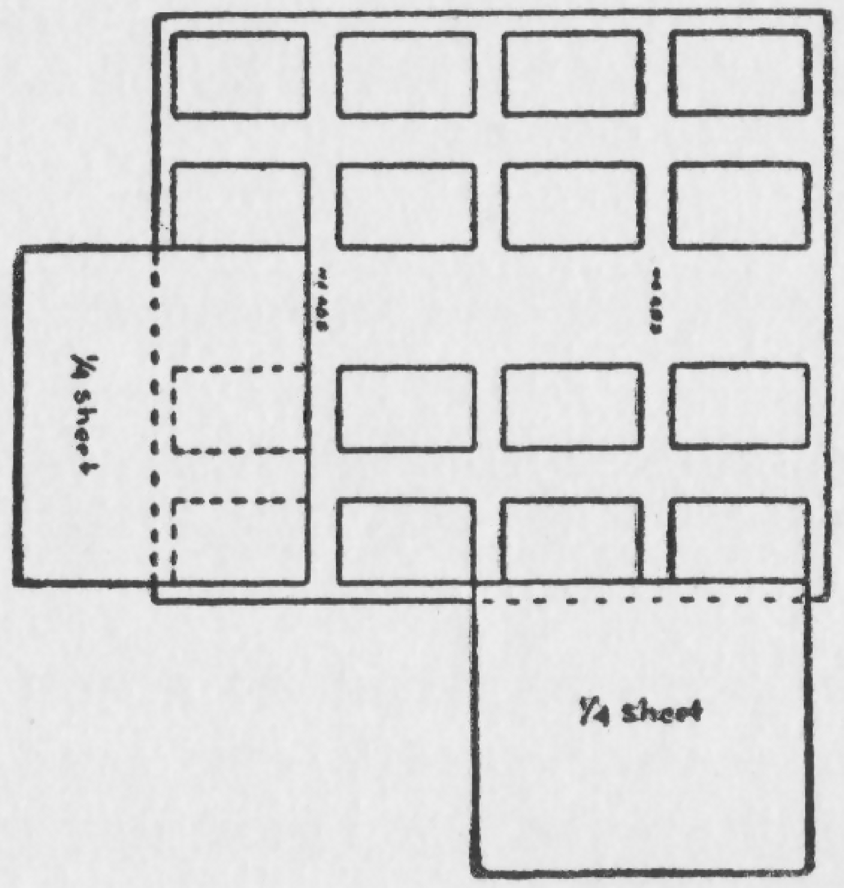


Illustration 5

1. Diagram showing how a quarter part of a sheet may be used to advantage in locking up a form to insure proper margin

The method of line-up for a sheet of this nature is exactly the same as for the individual unit job previously explained. The only difference in the actual operation is due to the changes in the measurements which are not uniform but change to allow for the different margins and trim in the book.

The distance between the stab line-up marks must take into consideration the trim on the tail of the page. Then the sheet should be squared up and stabbed at the back edge and ruled according to the stab marks. The side of the pages should next be

stabbed and lined up similarly to the stabbing and lining up of the head and foot of the page.

On work and turn forms one-half of the form may be lined up and the other half placed into register by register in the back up. Key sheets on regular publication work help considerably. These key sheets may be kept from one publication to the other and used exclusively for line-up for the outside form. The key sheets should contain full pages of some previous issue and should be printed on a colored unfinished stock. The outside form can then be registered into this key sheet without the trouble of line-up. Inside form would be lined up by registering with the outside form sheet.

On saddle stitched jobs of large page content some trouble may be experienced in determining the proper margin on the pages that form the outside portions of the book. This is due to the "wrap around" on the binding edge requiring an allowance for the paper demanded by the back of the book. One good way of determining the amount of space necessary for this wrap around is to take the dummy with the full number of pages, keep it closed and stab through the book at the outer edge of the page. Be sure the stab marks go entirely through the book. Then open the book out flat and measure the distance between the stab marks on the cover and on the center spread. This difference will represent the paper stock required for the wrap around of the book. The space should

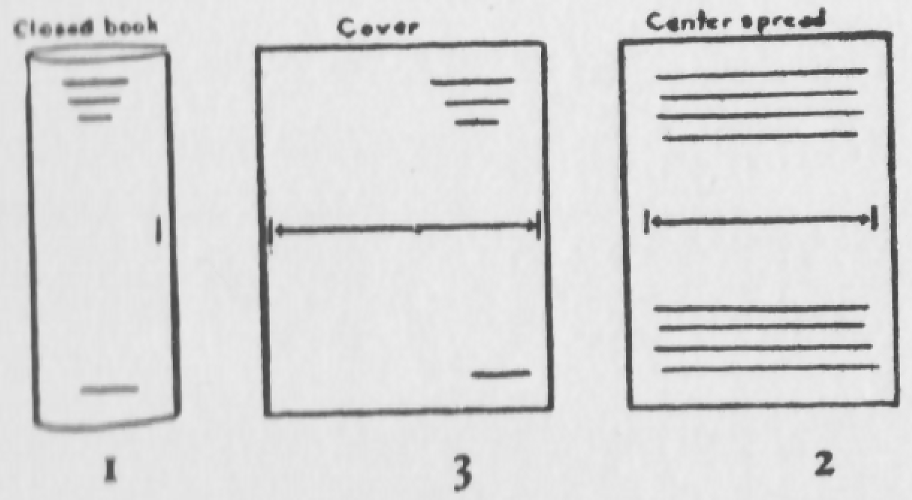


Illustration 6

1. Stab through book ½" from front edge.
2 and 3. Note distance between stabs on cover is greater than distance between stabs on center spread.

be placed in the back margins of those pages requiring the extra space. It will have to be graduated over the number of pages demanding it. (See illustration 6.)

Names and Usual Proportion of Book Sizes

Every pressman should know standard book sizes. There is some confusion as regards the old method of expressing sizes in names as compared with the new method of expressing sizes in

inches. Hugo Jahn in his "Dictionary of Graphic Arts Terms," gives the following definition for book sizes.

"Books are classified in a general way in sizes named according to the number of leaves into which a sheet is folded, as given in the following table. Books described as quarto (4to or 4°), octavo (8vo or 8°), etc., are understood as these numerical foldings of paper called medium (in America, 18x23 or 19x24 inches), or its equivalent in square inches in a slightly different shape.

Folding books from the medium size does not in some cases give desirable proportions, and modern practice is to use other sizes of paper which give approximately the shapes noted in the right-hand column of the table. These terms may also be applied to foldings of sizes of paper other than medium; especially is this true of octavo, which is often qualified by the name of the paper size under consideration, as crown octavo, demy octavo, etc."

Medium Paper	*Old Shape*		*New Shape*	
Folio	12 x19	inches	12 x18	inches
Quarto	9½x12	"	9 x12	"
Octavo (8vo)	6 x 9½	"	6 x 9	"
Duodecimo	4¾x 8	"	5⅛x 7⅔	"
Sixteen-mo (16mo)	4¾x 6	"	4½x 6¾	"
Eighteen-mo (18mo)	4 x 6⅓	"	4 x 6	"
Twenty-four-mo (24mo)	4 x 4¾	"	3⅝x 5½	"
Thirty-two-mo (32mo)	3 x 4¾	"	3⅙x 4¾	"
Thirty-six-mo (36mo)	3⅙x 4	"	3 x 4½	"
Forty-eight-mo (48mo)	2⅜x 4	"	2½x 3⅞	"

The terms had more definite meanings in early days, when there were fewer sizes of paper and the size of the finished book corresponded more nearly to the exact folding of the sheet. Today these terms describe the sizes of books only in a general way and their use is being discarded for the simpler and more accurate method of stating the dimensions of a page in inches (as 4x6 inches, or 6x9 inches), and the printed sheet by the number of pages (16-page, 8-page, etc.) that it contains. While the terms are usually discarded in the printer's vocabulary, they persist in the bookseller's trade and a knowledge of them is necessary and useful for every person having to do with the making of books.

Chapter II

Presswork

Presswork seems to be the least understood of all the operations that enter into a printed job. This appears to be due to the fact that most printing plant proprietors graduate from the composing room. Few men have the opportunity to control the fundamentals of the printed job in all departments of manufacture, yet every proprietor should understand the fundamental principles required for good presswork.

Ink, while a small item in the production of commercial printing, very often represents the difference between success and failure in the printed product. All the items that enter into a job—composition, presswork, paper stock, binding, and whatever else may be required—are sacrificed when the quality of ink is below standard. Ink reflects the quality contained in the job. Workmanship may be of highest kind yet an inferior grade of ink or an ink not suited to the printing conditions will ruin the appearance of the finished job.

Good presswork is dependent upon good material. Good material is material that is fitted for the work in hand. Material in some instances may be good for one job and not for another. Experience is the best teacher as to what material should be selected for production. It directs the selection of material and helps us to determine what material to use for certain production.

There is very little time left to make any serious changes in the materials bought or furnished when the job is ready to go to press. For this reason the quality of a job very often suffers because of the proprietor's indifferent attitude toward the conditions encountered. The general attitude on the part of the proprietor is to do the best he can with the materials on hand. Very often the "best he can" will not suffice to maintain the standard required by the industry.

In order to maintain a high standard of quality in presswork we should approach our presswork problems scientifically. These problems should be studied, the conditions of production known, and the results to be expected understood. Printing as we know it is really both an art and a science. Art is defined by the diction-

ary as "the study and expression of beauty"; science, as "systematized knowledge." These two definitions really express what every printer is trying to do in his daily task. He seeks the expression of beauty in his work and applies his knowledge to its production. The more systematically this knowledge is applied, the more scientific will our trade become.

The scientific approach to presswork problems includes, first of all, the testing of materials before the job goes to press. Plates and halftones should be tested for their screen depth and printing qualities. Screens should be tested as to their adaptability for certain stocks. Copper-faced plates should be checked up if they are to be printed in colored inks, especially reds. We recall one case of a process job, to be printed from copper originals, where the plate for printing the red was attacked by copper sulphate—a condition brought about through the use of a red ink containing English vermilion. It is best to find out and tell the man who will make the ink for the job what kind of plates are to be used. The height of the plate should be tested, as should the possibility of having the plate lie perfectly flat while going over the impression.

Paper stock should be tested in order to determine its printing qualities in combination with the plates furnished or supplied. Folding quality, surface, grain, finish and content of paper are important and should receive serious consideration before going to press.

Overlays should be furnished the pressroom at the time the form goes to press. It matters not what kind of overlays are furnished, whether hand, chalk, biscuit, or any of the various kinds of mechanical overlays in vogue today; they should be sent to the pressroom together with the form to be printed.

Ink should be tested before it is put on the press. Ink is one item that is purchased by the pound and sold by the printer in coverage capacity. Its specific gravity is a most important factor, yet this is disregarded by most printers in their purchases. The covering capacity should be tested, together with the tonal strength, an important factor in covering. The ability to dry satisfactorily as well as print satisfactorily should be determined.

Tests for tonal strength can be made by drawing out a small portion of the ink with an ink knife on a piece of the stock on which the job is to be printed. This test will also show the drying qualities of the ink, as well as its ability to cover. Undertones and overtones of inks are very confusing, and it is always best to draw out a sample of the ink in order to determine the color the ink

will print in a film, as represented by the conditions under which the job will be printed.

There is being constructed at the present time an ink testing machine, to be used for preprinting purposes, which will measure the thickness of the film of ink it will deposit on a sheet, will test the ink for its drying qualities, show the square inch coverage of the ink being tested, and register the amount of squeeze pressure required to print the paper stock on which the job will be printed. The thickness of ink film and the squeeze pressure will be registered in one-thousandth part of an inch. It may be stated that the specific gravity of different colored inks will be ascertainable by the printer through this mechanical device, which will tell him the covering capacity of a given quantity and weight of ink. Bulk, weight and coverage of ink will be registered mechanically.

Every pressman, in our opinion, should be equipped with a micrometer and a magnifying glass to enable him to reduce the factor of control in presswork to a one-thousandth part of an inch with his micrometer and see with his magnifying glass how the minute dot in a halftone plate is depositing the ink upon the stock.

The pressroom is really the nucleus around which revolves the entire printing industry. To it are sent plates, paper, ink and type, gathered from as many different trades and professions as may be represented in the materials furnished. All the pictorial side of the job is left to the ability of the pressman for suitable expression. All the inaccuracies that may have occurred in the production of the other material are expected to be overcome in the presswork on the finished product.

An excuse that a detail is not contained in a photo-engraving may explain the pressman's situation, but it does not excuse the proprietor when he is called to account by the customer to show reason why a faithful reproduction of a finished piece of art work was not delivered. When the quality of a job makes the delivery look dubious, consider the effect of this job on the customer.

It is best for the printing proprietor to know the worst when any job has not been produced up to standard. It is, indeed, easier for all concerned to adjust a discrepancy in production when all the factors are taken into consideration. When the pressroom superintendent tells the proprietor of the plant that a certain job has a slight offset instead of a serious offset, the superintendent is doing a grave injustice to the proprietor, to the pressroom and to himself.

Decimals For Printers' Material

The micrometer is one of the most important tools in the printers' tool kit. The standards for the various materials used in the industry are measured by the thousandth of an inch. These standards are shown here to help the printer maintain the proper measurements.

Type-High is	.918	of an inch
Height of Sectional Blocks and Bases for regular 11-pt. Plates	.759	"
Regular 11-pt. Plates printers' measure	.1522	"
Regular 11-pt. Plates, electrotypers' measure	.154	"
Regular 16-gauge Zinc or Copper Plates	.065	"
a tolerance of .002 is permitted		
Height of Bases for regular 16-gauge Zinc and Copper Plates	.853	"
Backing for Zinc or Copper to make 11 points for Patent Blocks	.090	"
Ad Plates (unmounted electrotypes)	.105	"
Monotype base for Halftones and Zinc	.853	"
Monotype base for Patent Base Electro–for Newspapers	.768 and .763	"
Monotype base for Patent Base Electros for Printers	.759	"
Height for regular Leads and Slugs	.759	"
Height of High Leads and Slugs	.875 or .853	"
Height of regular Iron Furniture	.680	"
Height of regular Metal Furniture	.664	"
1-point is	.01383	"
2-point is	.0277	"
3-point is	.0415	"
6-point is	.083	"
8-point is	.1107	"
10-point is	.1383	"
11-point is	.1522	"
12-point is	.166	"
72-point is	.996	"

Chapter III

Make-ready for Platen Presses

A hard packing is desirable at all times. Soft packing, although it saves time in make-ready, becomes indented and forms a matrix of the impression. The packing should also be as thin as possible. The thickness depends upon the nature of work generally run on the press. Shops that run heavy card stock set their presses to accommodate the heavy stock. On these presses more packing is used when paper stock is run on the press.

An ideal packing for a platen press measures about .046 of an inch and consists of:

2 manilas (placed in bales)	.010 of an inch
2 sheets of its own (being printed)	.006 of an inch
2 pressboards or manila tagboards	.030 of an inch

The contents of the packing may vary. The manilas could be .010 each in which case the pressboards or manila tagboards would be .020 of an inch. The total, however, would be the same.

Some pressmen, in order to get a real hard packing use a sheet of tin or celluloid directly under the top sheet instead of pressboards.

The platen is dressed in the sequence as shown—2 manilas—2 sheets of its own—then the pressboards or tagboards. After the job is made ready to run the pressboards will be between the 2 manilas and over the overlay for the job. Dropping the overlay in the packing, that is, carrying it to a lower position in the packing, gives a uniform effect to the printed impression. The higher the overlay in the packing the more drastic its effect upon the printed sheet. This is especially so on halftone plates.

The sequence of make-ready on a platen press is as follows:

1. Dress the platen. Place the 2 manilas in the bottom bail. Place the pressboards or tagboards under the 2 manilas. Place the 2 sheets of its own between the pressboards and the manilas.
2. Ink the press.
3. Place the form in the press—quoins up. This gives the solid side and end of the form to the bottom and side guides.
4. Check to see if grippers clear the form.
5. Pull impression on top sheet or draw sheet.

6. Get position of sheet to be printed. If form is to be centered on sheet, place sheet to be printed at left edge of printed impression on top sheet. This puts all the side margin of the job on the right side of the sheet. Fold this margin in half. Move sheet over to center on printing (place crease on right edge of impression on top sheet) and indicate by pencil mark the position of the sheet. Repeat this operation for the top and bottom margins. Side margins are generally considered first. Top and bottom margins are considered second.
7. Attach guides. Most pressmen prefer to place the bottom guides out toward the end of the sheet. There is no fixed measurement that can be given regarding the proper position of the bottom guides. Experience dictates the most efficient position of these guides. The side guide is generally placed below the center of the sheet. The exact position is best selected by experience.

   If McGill gage pins are used as guides the attaching operation is simple, consisting of insertion of pin in top sheet at proper position.

   If quads are used for guides these are attached to the top sheet as follows. Place the sheet to be printed in the proper position on the top sheet. Mark the place on the top sheet where the bottom and side guides are to go. Put a small quantity of LePages glue on the quad. Place the quad, glue side down, on the top sheet one-half inch away from the sheet. Move the quad across the surface of the top sheet in such manner as to force out all excess glue between the quad and the sheet. When quad becomes hard to move slide it up to the edge of the sheet in proper position. Place all quads in the same manner.
8. Pull sheet for mark-out and make-ready. Before taking this sheet out of the press stab it for placement in the packing. Make two stab marks on each side of the sheet nearest the feeder. These are made at right angles in order to match the make-ready sheet in both directions.

   Some pressmen prefer to pull an impression on the second manila in the packing on which to match and paste the overlay or marked out sheet. This is done by opening the bottom bale lifting the top manila out of the bale, holding it out of the press while the impression is made. The top sheet is then placed back into the bale. All marked out sheets or overlays are pasted to this impression on the second manila.

9. After patching up the make-ready sheet place it in the packing. Open the top bale. Lift the top sheet. Paste the patched up sheet to the second manila. Place the pressboards over the make-ready. Place the top sheet under the top bale, smooth out the top sheet and fasten it with the bale.

   If there is need for a second mark-out sheet proceed as before. Be sure to take one sheet out of the packing for each mark-out sheet put in the packing.
10. Paste straps over guides. Cut a "V" shape slit in front of each quad with the pointed opening toward the quad. Paste a strip of paper, slightly narrower than the quad, under the "V" slit up the side—over the top—down behind the quad and on to the top sheet.
11. Place fenders at guides to keep sheets from going over guide. Cut a straight line in the top sheet about one-half inch long alongside but inside of each bottom guide and below the side guide. The cut should be about 6 points behind each guide. Take a strip of pressboard one-half inch wide and about two inches long. Slip it into the cut. Put glue on the top side of the strip and slide it about one inch into the cut top sheet. Be sure the side guide fender is behind the guide or it will interfere with the feeder seeing the guide during the run of the job. Fenders must always clear the printing form.
12. After the O. K. is received and the fountain is set, the job is ready to run.

Chapter IV

Make-ready for Cylinder Presses

The make-ready on a No. 2 Kelly Press has been chosen as a typical case showing the usual method of make-ready for cylinder style presses. The make-ready operation is the same on all styles of cylinder presses. The only difference in press preparation is the adjustment of the press itself for printing operation. The steps in make-ready of the No. 2 Kelly Press, therefore, are similar to the steps in make-ready on any style cylinder press as far as the technique for mark-out and form preparation are concerned.

The amount of packing required on the cylinder is dependent upon the depth of the impression surface below the bearers. This depth varies in different makes of presses. The press must be packed to accommodate this requirement. On the No. 2 Kelly Press this depth is .057 of an inch. The impression surface on a press used to print thick cardboard would obviously be cut to a greater depth than that on a press used to print commercial printing paper stock.

Each press has a permanent packing and a temporary packing. The permanent packing is that which is placed below the draw-sheet on the press and remains there until accident or other causes require change. The temporary packing is that which is known as the make-ready packing and this packing is generally changed with each job, especially in those plants that do a good grade of commercial work.

The packing recommended for good grade work is of the hard variety. It should consist of manila sheets with two or three super sheets to allow for the make-ready. Some pressmen prefer press-board but in general the manila sheet has replaced the pressboard which was used for the permanent packing on the press.

Hard packings produce a higher quality printed product than do soft packings. A hard packing necessitates greater care and more work in patch-up and make-ready than a soft packing. Soft packing consists of four or five sheets of news stock directly under the top sheet. This soft packing, with its resiliences, tends to take up the inaccuracies in the form. When run for several thousand impressions, however, this soft paper forms a matrix and

affects the impression on the printed job, therefore, hard packing is recommended at all times.

In dressing the cylinder the permanent packing should consist of four manila hangers, these measuring .006 of an inch. Next, one draw sheet of manila stock similar in thickness to the hanger. This draw sheet is fastened around the first packing winding shaft and represents the permanent packing. The make-ready packing consists of three manila hangers which measure .006 of an inch and the top draw sheet of the same thickness. Directly beneath the draw sheet is placed two S. & S. C. sheets which are super and measure .003 of an inch each. These are placed in the clamps in the same manner as the manilas after which the top sheet is placed in the clamps drawn over the super and fastened around the second winding shaft.

The completed packing should contain the following:

4	Manilas	.006=.024 of an inch
1	Manila draw sheet	.006=.006 of an inch
3	Manilas	.006=.018 of an inch
2	S. & S. C. Super	.003=.006 of an inch
1	Manila top sheet	.006=.006 of an inch
		Total–.060 of an inch

This .060 of an inch is .003 of an inch more than the .057 of an inch depth of the impression surface of the cylinder below the bearers, and allows for the pressure on the sheet being printed.

If paper stock of greater thickness than .003 of an inch is to be printed it is necessary to reduce the packing to accommodate the thickness of the sheet.

Setting the Grippers

After the correct amount of packing is placed on the press the grippers should be adjusted to insure accuracy and perfect register. This operation of adjusting grippers must be done with the full complement of manila and makeready sheets on the press. The operations are as follows:

1. Move the press ahead to the printing cycle just where the gripper tumbler has cleared the tumbler closing pin.
2. Loosen all the grippers and allow the gripper tumbler to rest on the block which is located on the outside of the feeder side of the cylinder.
3. Raise the tumbler from the block with a screw driver or

wrench and place two pieces of manila stock .012 of an inch between the tumbler and the block. The .012 of an inch refers to the No. 2 Kelly Press. This measurement varies on other cylinder presses.

4. Locate the grippers so that they do not interfere with the stripper fingers.
5. Hold each gripper down firmly on the cylinder and tighten the clamp screws. Start from the center gripper and work both ways alternately, this helps equal spacing.
6. Be sure in spacing the grippers to provide for equal distances so that in moving feed-board tongues for different size sheets these tongues will not come too close to the grippers. Grippers that close too near to tongues sometimes cause wrinkles and slurs.
7. After the grippers have been tightened securely remove the manila strip from between the tumbler and the block.
8. A further test should be made on the grippers to see that they are holding securely. Place a strip of paper under each individual gripper to test that each individual gripper is holding properly and is correctly adjusted.

Grippers perform their most important function in maintaining register. They should hold the sheet firmly during the printing cycle. Careful pressmen always test and reset grippers before starting a run requiring close register.

Setting Stripper Fingers

Stripper fingers are set to work close to each gripper and shoofly finger so that when the sheet is raised by the shoofly finger at the point of delivery it will be carried forward on the stripper fingers to the tapes. Do not move stripper fingers unless to clear the side edge of the sheet. These stripper fingers are adjusted to clear the packing about 1/32 of an inch. Lower adjustment is not necessary.

Adjusting Shoofly Fingers

The shoofly fingers are operated from the gear side of the cylinder. The fingers rest on the packing and serve to raise the sheets from the cylinder to the stripper fingers at each delivery cycle. Set fingers close to gripper but not too close so as to interfere with their operation. Setting shoofly fingers too close to grippers will also interfere with the operation of removing the shoofly

fingers from the press during the make-ready. It is important to note that shoofly fingers open only when the cylinder is just leaving the impression.

Adjusting the Tongues

Drop guide tongues which support the sheet should be set so as to clear the gripper and shoofly fingers. The tongues should be set about two manilas above the full packing. If they are set too low they will interfere with the delivery of the sheet and if set too high they may cause a buckle or slur.

The feed-board extension plates should line-up with the top of the cylinder bearers when cylinder is up. This test may be made by using the straight edge to adjust for height. Raise or lower the feed-board by adjusting the feed-board screws and be sure that the set screws are firmly tightened after the adjustment.

Setting the Drop Guides

1. Turn press forward until grippers have closed to take the sheet.
2. Move tongues between grippers and shooflies to conform to the size of the sheet to be printed.
3. Move cylinder back until tongues are over the open space in the cylinder.
4. Loosen clamp screws on drop guide and set them so that they just touch the tongue lightly.
5. Turn press forward until grippers are about to close on the packing in the printing cycle and about 1/16 of an inch above the packing.
6. Loosen binding nuts on adjusting screw and turn screw until the guides are about to rise from the tongue.
7. Hold screw firmly and tighten binding nuts.
8. Place sheet down to drop guides and turn press ahead until grippers have taken it. If guides are timed too closely the edge of the sheet will be torn and the guide must be adjusted to rise slightly faster. Some pressmen make this final adjustment while the press is running in order to insure the correct timing which will permit the guides to rise slowly enough to prevent nicking the sheet. It is best to slow up the guides so that they just nick the sheet and then time them faster so that they just clear the sheet. Proper setting of the guides controls, to a large degree, the register of the job. If the guides rise too quickly the sheet will be pushed forward if they rise too slowly they will nick the sheet. Between these two extremes lies

the perfect position for drop guides on cylinder style presses.

Locking Form On Press

There is a deadline on all cylinder style presses. On the No. 2 Kelly this deadline is scribed across the head of the bed from bearer to bearer and guides the operator in gauging the form on the bed. The Kelly Press gripper edge is opposite to that of other type cylinder presses. The gripper edge is away from the pressman when he places the form on the No. 2 Kelly Press. It is nearest to the cylinder pressman when he places the form on most other style cylinder presses. Be sure that the form clears the deadline and adjust the furniture on the bed of the press accordingly. Most printing plants have a duplicate deadline gauge for the composing room in locking up forms in the chase to prevent loss of time in shifting the forms on the press. The deadline gauge is a necessity for accuracy in locking the form on the bed of the press and each pressman should have his gauge available at all times. To lock the form in the bed of the press properly, proceed as follows:

1. Place the form on the bed of the press. Loosen all the quoins.
2. Make sure chase lies flat on the bed. Use wood furniture between the chase and the clamps and the chase and the ink plate. Wood furniture should not overhang the edge of the bed more than 2 picas.
3. Check all quoins in the form to be sure they are loose. Tighten the chase clamps slightly. This operation locks the chase into the bed of the press. When satisfied that the form is free from the chase by checking all quoins to see that they are loose, tighten the chase clamps to their proper position.
4. Tighten all quoins in the form, first tightening them with the fingers. Plane down the form. Then tighten quoins securely. Test to see that the form rides solidly. This operation locks the form into the chase.
5. When a side lock is necessary for close register work on a No. 2 Kelly Press place the side lock consisting of reglets and leads outside the chase between the chase and the bearers. This is done when the quoins in the form are loose. The side furniture is placed between the outside part of the chase and the bed bearers and generally fills the space snugly so that when the quoins are tightened the quoins lock the side furniture.

Setting the Rollers

The form rollers are adjusted for height to the form and ink plate by means of knurled head screws below the roller socket. Place the rollers in the roller socket, marking them by means of a notch in the end for identification. A No. 1 roller carriers 1 notch cut into the composition and is the roller next to the cylinder. It is the No. 1 roller because it is the last roller in this set to leave the form. The No. 2 roller is the center roller and carries two notches and the No. 3 roller is the one nearest the ink fountain and carries three notches. These notches are identification marks for replacing the rollers in the press after they have been washed up. Notches are on the feeder side of the rollers in the press. To set the form rollers move the press ahead until the ink plate is under the rollers and proceed as follows:

1. Lower all sockets on both feeder side and gear side until the rollers rest on the ink plate.
2. Then raise the sockets until the roller bearings touch the bottom of the socket.
3. Move the press ahead until the bed is on the delivery end and the ink plate is clear of all rollers.
4. Lower the vibrator carriage and lock it.
5. Set No. 1 and No. 2 rollers lightly against the vibrator nearest the cylinder. Set No. 3 lightly against the small vibrator. Always be sure that bearings are turned in the right direction when putting rollers on the press.

Rider Rollers. The rider roller bearings can be raised or lowered for the rider rollers to obtain proper contact with the vibrators.

Vibrator Rollers. To regulate a stroke of the vibrator rollers loosen the binder screw in the vibrator nut locking plates located on the gear side of the vibrator roll arm between the two rolls, and back-out adjusting screw until the desired stroke of the vibrator is obtained. Then tighten the binder screw to prevent adjusting screw from working out of position.

The Ductor Roller contact with the ink fountain roll and ink drum is maintained by opposing springs on the ductor roll arm.

Setting the Auxiliary Distributor

1. After the job has been made ready set auxiliary on the press.
2. Move bed in position midway between the feeder and delivery end of the press. Set the form roller to the form.
3. Move bed to the extreme feeder end so that the form roller clears the form. Set form roller lightly against the steel vibrator roll.

4. Move the Auxiliary Distributor assembly into its working position and see if the gears are properly meshed and fastened with the nailhead screws into support brackets.
5. To set the lift of the form roller move the bed to extreme delivery end. In this position the form roller lifting cam rolls are on high part of the lift cam. To raise form roller off the form turn headless set adjusting screws in clockwise direction. One thickness of a post card stock is usually sufficient raise to clear form if the form roller is true. This test should be made by sliding a card between the roller and the form all the way across the form.
6. To set the rider roller place the rider roller in the bearing. Loosen the bearing binding screws to permit roller to drop against the steel vibrator of its own weight. Tighten binding screws with the roller in this position.

The Make-ready Operation

After the rollers have been set and the sheet located for position the pressman proceeds in the usual manner for mark-out and patch-up of his overlay. If hand-cut or chalk overlays are used for halftones, they too are generally pasted to this overlay sheet. In some instances the pressman may paste them directly to the draw-sheet. If the sheet that has been marked-out or patched-up has been pulled on a single sheet it is necessary to take one sheet out of the packing when the overlay is pasted in. The exact thickness of the packing should be maintained at all times.

After the job has been made ready and the fountain set to supply a sufficient amount of ink to the form the feeder and delivery are adjusted to handle the sheets to be printed. Complete explanation of this operation is contained in the Book of Instructions for the No. 2 Kelly Automatic Press as published by the American Type Founders Sales Corporation, 200 Elmora Avenue, Elizabeth, N. J. These books are furnished operators of No. 2 Kelly Automatic Presses and should be studied and understood by all who work around the No. 2 Kelly Automatic Press.

Numbering Machines on Cylinder Presses

The best results in the operation of numbering machines on cylinder and job cylinder presses are secured when the plungers run either across the cylinder or away from the cylinder. This adjustment facilitates the operation of the numbering machine at a time when the numbering wheels are not in contact with the impressions.

Most numbering machines turn over on the up-stroke of the plunger. If the impression of the numbering machine is taken during this turn motion it will affect the result of the finished product.

Chapter v

Overlays and Make-ready

Everyone will concede that the cost of a make-ready is determined by the care put into that make-ready. Care and cost travel hand in hand. Both increase or decrease in the same proportion since each is affected by the other. Careful make-readies for halftone engravings demand overlays except on small runs. An omission of overlay naturally decreases the cost of make-ready but in the same measure it will decrease the quality put into the job if the run is large enough to demand overlays.

Short runs do not always require overlays for the halftones. The clean and crisp appearance of engravers' proofs, in which much effort is directed to the securing of a few good impressions, indicates that an overlay is not required to enhance the appearance of the engraving on short runs.

Reasons for Overlays

Overlays for halftones are not needed merely to make a job "look better" but are really needed to make the job look better for a longer period of time. The details contained in a halftone plate are put there via photography, etching, re-etching and burnishing. When a detail consisting of a semi-solid is required, the pressman may put an extra piece of S. and S. C. on that particular spot but he will not be putting detail in the plate. This extra impression in some one part of the plate acts exactly the same as if the photo-engraving finisher burnished the halftone dots in that particular place in order to make them look darker.

When a pressman tries to lighten a certain spot in a halftone plate he lightens up on the pressure by eliminating the squeeze in that particular part of the plate. In doing this he breaks up the highlight dots so that some of the dots will not print. This condition makes for a very uneven screen which is immediately noticeable to the naked eye. When the highlight detail is to be made lighter the photo-engraver re-etches the spot to be lightened, and thereby etches the dots to a smaller printing surface which allows for more white paper to show and in this way gains the desired lightened effect.

When the engraver is finished with the halftone plate, the details contained therein are dependent upon the amount of etching and re-etching done by him. These details are not materially changed by the pressman's overlay. It is true that the overlay will help the halftone look better for a longer period of time but this is accomplished by preventing the halftone to show a wear. A wear in a halftone plate is really the changing of the size of the halftone dot. The worn areas generally appear in the highlight section of the halftone plate and show the effect of the halftone dot becoming larger at the top, very much the same way as caused by burnishing.

When the printer is confronted with halftone electrotype plates in medium and long runs he, naturally, must increase the cost of his makeready. The old adage, "The less done with a halftone plate the better for it," is a true one. With precision plates, blocks and presses of today the flat impression make the best starting point for the halftone plate. With this flat impression and all the details printing satisfactorily the pressman has all that the customer desires. But there is more than this one sheet on the job so the pressman seeks a method to maintain this satisfactory printing condition on all his sheets and impressions.

Overlays the Best Method

The best way of maintaining detail in halftone plates is with the overlay. These overlays are costly, especially when the method used demands that the press stand idle while the overlays are being made. The most costly of all is the hand-cut overlays, especially when the pressman cuts them after the form has gone to press. The hand-cut overlay is a good overlay, but it should be cut before the form goes to press. Some of the newer methods of making overlays permit of making them from the form after it has gone to press but the overlays themselves may be used immediately upon completion. With these newer overlays the loss of press time through idleness is reduced to a minimum.

The most used overlays of today include the hand-cut, chalk, biscuit (or flour), cameo and zinc.

Hand-cut overlays are very useful, especially those of the "skelly" variety which provide for the dropping of the highlights only. When the three- and four-ply hand-cut overlay is to be used the overlays should be cut before the form goes to press. This will provide for reducing the cost of the make-ready because of using the hand hour rate instead of the press hour rate of doing the job while the press is waiting.

Chalk overlays must be made from press proofs before the form goes to press because the chlorinated lime solution used for etching demands that the entire sheet be placed in the etching bath and then washed in clear water. The sheets must be allowed to dry after which they are ready for use. Chalk overlays permit of getting a minute detail even finer than that secured with the hand-cut overlays.

Biscuit or flour overlays are used by some large color printing establishments. The process consists of pulling a flat impression with gold size ink, then rolling a generous supply of wheat flour over the entire sheet by simply rolling the flour from end to end. The surplus flour is shaken off the sheet and the balance of the flour adheres to the ink. The sheet is then sprayed with a solution of shellac and when this shellac is dry the overlay is ready for use. The highlight sections of the halftone plate should be scraped in order to remove the shellac that may adhere to it. These overlays are sometimes used in pairs, one on top of the other, in order to get the best result on the job. These overlays are generally made while the form is on the press although they could and should be made before the form goes to press.

Cameo overlays are the result of the Thermographic process of printing formerly known as Engraved Effects and raised letter printing. The manufacture is similar to the biscuit overlay except that a special ink is used in pulling the impression on cameo stock and a special powder is dusted on the sheet in a similar manner as was the flour. The sheet is then held over a heater and the powder is allowed to partly fuse. Then the highlights are scraped so as not to allow any powder to remain. After the highlights are cleaned out the sheet is again subjected to heat until the powder is entirely fused in which case the solids rise above the surface of the sheet and give the added impression demanded. These overlays are very often made while the form is on the press because they may be used immediately. These overlays should also be made before the form goes to press in order to facilitate matters and reduce costs.

Zinc overlays are made similar to the chalk overlays except that the etching solution is different because the overlay itself is made on zinc. These overlays must be made before the form goes to press because the halftone plates alone are locked up in a job press. A special stiff ink is used for this process and it is generally applied by hand. The ink is acid-resisting and a clean sharp proof of the halftone is pulled. A special acid-resist powder is then dusted over the plate, the surplus powder is removed from the plate and the remaining powder is combined with the ink by the application of heat. The metal plate is then etched in an acid solution which dissolves the exposed metal. The etching is continued until a satisfactory depth is obtained. This type of overlay can be manipulated to give very fine detail results similar to the chalk overlay previously explained.

All overlays have advantages and disadvantages. Some are best fitted for special kinds of work—others qualify for all kinds of work. Hence, every particular printer should see to it that the proper kind of overlays are used in his pressroom.

Hand-Cut Overlays

Hand-cut methods of making overlays are generally divided into three kinds, two-ply, three-ply and four-ply. The division is made according to the detail of the subject matter in the halftone plate.

Some halftone engravings show only two tones, white and black, or in other words solids and high-lights. Others show three or four distinct tones requiring individual attention for each tone. The tonal value of the engravings themselves are best determined by holding the proof at arms length in order to study the tonal value of the section of the plate itself.

The most effective paper to use for hand-cut overlays is the sized and super-calendered which measures about three one-thousandths of an inch in thickness and is generally to be found in the sixty-pound basis 25x38 S. and S.C. book.

For a two-ply overlay two impressions of the subject on the sixty basis stock are required. One of these proofs acts as the base of the overlay to which are pasted the other tones in the plate. On the two-ply overlay the solids are cut from one of the proofs and pasted over the solids of the base sheet. This operation must be carefully performed and the solids must be pasted in perfect register. When the high-lights are cut out of this base sheet the overlay is known as a skeleton overlay. When this overlay is placed in the packing of the press in proper position it will give an extra three one-thousandths impression or pressure on the solids and will relieve the impression on the high-lights to the same extent. The control of this is based on removing one or two sheets from the packing when the overlay is inserted.

For the three-ply overlay three impressions are pulled. One of these impressions acts as the base to which is pasted the solids as well as the intermediate tones from the other two proofs. The

solids from the first proof are cut out and pasted into register over the second proof the same as in the two-ply overlay. The third proof has the high-lights cut from it and the entire sheet with the high-lights cut out is pasted onto the base sheet. There are now three thicknesses of paper on the solids, two thicknesses on the intermediate tones and one thickness on the high-lights for a three-ply hand-cut overlay. Drop two sheets sixty basis S. and S.C. from the packing when these overlays are pasted in. Solid thickness will be three sheets, intermediate tones two sheets and high-lights one sheet.

A four-ply overlay is generally used where there are a considerable number of impressions to be made from the halftone plate. This, of course, is only done when the plate itself contains four or five distinct tonal values. The method of cutting a four-ply overlay is the same as explained for the three-ply with the exception that the intermediate tones are considered as an individual tone rather than considered with the solids as was done in cutting the three-ply overlay when the high-lights were cut from the sheet, leaving in the sheet the semi-solids and the solids. The four-ply overlay would require four proofs, one of which would be used for the base. The solids would be cut from one proof and pasted into register on the second sheet as previously explained. The next sheet would have cut from it the high-lights and the semi-solids or the tonal values between the high-lights and the solids. This would be pasted on the base sheet after which the high-lights would be cut from the next sheet and this sheet then pasted on the top.

Overlays of all kinds give their best results when placed near the top of the packing. In this position they give a sharp detail of their contents. When dropped down in the packing they give a softer effect. For rough paper and hard paper stock it is best to place them near the surface of the packing.

There may be times when overlays should be cut on paper stock heavier than the sixty basis S. and S. C., measuring three one-thousandths of an inch (.003), mentioned herein. Heavy stock, cover stock, sometimes require this change.

For pressman's mark-out overlay or spot-up sheet explanation of patches and symbols see illustration #26 page 224.

Chapter VI

Uniform Make-ready Methods

The turnover cost of changing pressroom personnel is appalling, even though the men hired may be trained journeymen pressmen. The reason for this is that the new man always requires time to become acclimated to the new surroundings. Then, too, the method of make-ready practiced by the new man may be different from the method used by the other men in the pressroom. There can be many reasons why a new man will take more time to do a given piece of work than will a regular employee. Some pressmen will always take more time on a given form than others who take into consideration the value of eliminating lost motion in labor operations. The human element must be considered. It is possible to get the utmost production with minimum effort on the part of the men. This can be done by standardizing the work in such a way that the operations will be uniform on all presses regardless of who does the work or where the job may be left off by one crew to be picked up by the next. Incidentally this pick-up on one man's work by another man is a thing that the pressman abhors because he then feels that he is not embodying his individual and exclusive handiwork in the job being produced.

Plants that have two shifts should issue instructions calling for uniform methods of operation as demanded by the management. These instructions can also be issued to the pressmen in the plants that have only one shift. It will effect a saving on presswork production for both make-ready and running. Instructions can be issued to the men in the form of standard practice information at the time they are hired or on the back of the time sheets used by the men.

A standard, uniform method of make-ready for cylinder and job cylinder pressrooms may be based upon the following suggestions.

The Live Form Rack. Each pressman is expected to check up his assigned form to see if it has been O.K.'d by the stoneman. The stoneman's O.K. generally appears on the chase in chalk.

Locking Form On Bed of Press. Place the form on the press and loosen all the quoins. This will tend to take the pressure off the chase. Take the slack out of the chase by locking the chase in the bed of the press. Next test chase to see if it lies perfectly

flat on the press bed. If the chase does not lie flat, insert short leads, or pica reglets at each place outside the chase where the furniture touches the chase. Putting short leads at these places tends to force the chase down toward the bed of the press and overcomes the "belly." A chase that springs up at each impression is very apt to cause work-ups in the form while running. Therefore, avoid trouble by removing all springiness. Don't take a chance, but take the time to fix the form correctly before you proceed with the make-ready. After the chase is locked firmly in the bed of the press proceed to lock the form into the chase. Be sure that the form lies perfectly flat. If there are any signs of springiness in the form, stop and take it out by the same method used for taking it out of the chase. It is possible to eliminate this spring in the form by inserting low cards between pages. Such cards should be inserted directly against the type page. It is also possible, if permissible, to insert cards between lines of slug composition—though it must be remembered that to insert cards between the lines makes the type page longer than it is supposed to be and this will not always be tolerated by the composing room or the customer. Exercise some judgment here.

It is not deemed wise to make-ready a form that is not properly locked into the bed of the press. Poorly locked-up forms give trouble after the job has started to run so that the make-ready time may be wasted. In cases of this kind the entire form is apt to work up and squeeze the impression so that it will be punching through the sheet.

After you are sure the form has been properly locked in the press pull two sheets. Submit these sheets for O.K. to the composing room for correctness of material and final reading, if required—and to the bindery for O.K. of imposition.

Packing the Cylinder. Cylinders require two kinds of packing methods, one for jobs that contain overlays, hand-cut or mechanical, and one for the jobs that do not require overlays. Each method must be used separately. Unfortunately, the cylinder press cylinders are not always cut to uniform depths and some makes of presses require a greater amount of packing than do others. All cylinders should be packed with enough packing to secure a proper impression from a type-high form. An extra sheet of super stock above the bearers is generally necessary to accomplish this. A straight edge placed across the cylinder bearers will show the number of sheets required for the packing. This can be determined by testing with the necessary number of pieces

of the kinds of paper stock used. Some pressmen use a pressboard for the base and manilas and super stock for the balance of the packing. Other pressmen use all manilas and super stock for the packing.

Packing the Press for Forms Without Mechanical Overlays. A good packing for this kind of form is one manila top sheet, five sheets of super stock (50-pound basis), one manila draw sheet to be fastened on the second reel of the press. All the other necessary packing should be placed under this draw sheet. Manilas that measure about .012 or .006 of an inch should be used for the top sheet and the draw sheet. It is not necessary to use pressboard for the base. Manilas may be used to good advantage for this purpose. A packing of this nature made uniform and applied in this manner will show economy in production and will be easy for each pressman to carry through when he picks up a make-ready from another pressman.

Make-ready of Forms Without Mechanical Overlays. After the form is planed down and the cylinder packed, test the grippers. If they need setting, attend to them. For cylinder presses place the cylinder in the printing cycle and, while the grippers are closed, loosen all grippers and place a two-point lead between the tumbler and the tumbler rest. Tighten each gripper separately with one single strip of super stock underneath it. After all the grippers have been set and tightened try the tension of each gripper by pulling the strip of paper from under it. After setting the grippers, set the guides to get about two picas gripper bite. It is dangerous to take any greater gripper bite and it is not safe to take a smaller gripper bite. It is best to move the form rather than make a greater difference in the gripper bite than is good for the job. After the customary O.K. position is received, proceed with the make-ready by pulling an impression on super stock of the same weight as used for the packing. This impression should be pulled on top of a sheet being used for the printed job. Mark-out and spot-up the sheet as per the mark-out and insert the spot-up in the packing by cutting into quarters or eighth sheets depending upon size of form and pasting on the manila draw sheet that is below the fifth super sheet. Then tear out one super sheet and pull an impression on a sheet of the stock to be used for the job. If another spot-up is needed tear out one super sheet and pull an impression on super stock which is again pulled on top of the sheet of its own stock. Spot-up and place the spot-

up in the packing and pull an impression on another sheet of its own stock.

Packing Cylinder for Jobs Containing Mechanical Overlays. Pack the cylinder with two manila top sheets, five super sheets and one manila draw sheet. The only difference in this method of packing the cylinder is the two manila top sheets which are tightened together on the reel. This additional top sheet is to be used for a point sheet as explained later.

Make-ready of Forms With Mechanical Overlays. After everything is satisfactory pull an impression on a sheet of its own stock. Hold this for future reference. Next place a sheet of its own stock under the top sheet, get the press in its proper motion or speed and pull a packing (an impression on the top sheet). The manila will then be printed on the same impression (pressure) as was the impression pulled on its own stock. Take the impression pulled on the top sheet and stab the sheet for each section. Be careful of this operation, and if there are many halftones in the form the sections should be small. The stab should be made on each side of the section and in the center from the grippers to the back end so as to spread the overlay both ways of the sections. It must be remembered that the sinking of the overlays in the packing throws them out of register and for this reason the stab marks are made in the center to spread the difference of the position of the overlays when pasted on the draw sheet. After the top manila has been stabbed remove it from the cylinder and cut it into sections. After this is completed proceed with the mark-out for halftones by using the sheet of its own for guidance and a carbon sheet to transfer the marks to the back of the manila sheet. Then attach the overlays and the spot-up sheet to the manila draw sheet below the super sheets used for the hangers. All hard edges on vignettes should be removed on this impression on manila. The fact that the manila sheet is being used for a mark-out and a base sheet as well will help to get the make-ready done in less time than if an additional sheet were used for the base sheet. The next spot-up sheet is pulled on a super sheet over a sheet of its own, marked out, patched up and then placed in the packing. A sheet of super is then removed from the packing. If an additional spot-up sheet is required the same procedure follows as previously explained. Never use a coated sheet for a spot-up because this sheet becomes affected by the impression and later acts as a matrix, showing the result in the printed sheet.

The point system of make-ready on cylinder presses begins with the usual method of make-ready. The press is packed in the usual manner and two manila sheets are used for the top sheet. Both of these sheets are fastened on the top sheet reel. The form is locked in the press, planed down in the usual manner and it is assumed that the cuts are correct height. In printing the vignettes it is suggested (by H. W. Hacker) that they be dropped a few thousandths below type-high. We have known these to be carried three one-thousandths of an inch below type-high. The impression is pulled and the sheet lined up for position. The job is made ready in the usual manner and when the spot-up sheet is ready to be placed in the packing it is done in the following manner. An impression is pulled on the top sheet. Point or stab marks are made in each section of the sheet. That is, if the sheet is going to be cut in four pieces each of these four sections is stabbed individually. The top sheet is then removed from the reel and lifted from the clamps. The top sheet is cut in four pieces and the overlays and spot-up sheets are pasted to these four pieces of manila top sheet. The manila top sheet is then pasted in the packing on the press and to the point mark of the stabs previously put there. It is the indication of position by stabs or point marks that gives this method of make-ready the name of the point system. This system of make-ready is valuable for vignette edges and helps to locate the proper position without stabbing or punching them individually.

Setting the Fountain. It is very important that the fountain be set correctly before the job is started. Always start from the center keys and work out to both sides when setting a fountain.

Setting Rollers. Be sure all rollers are riding the form and ink table properly. Always use a guage or a tester in order to ascertain if rollers are properly set. A set of rollers can easily be spoiled if permitted to run when improperly set. Where rollers cannot be set to an ink table it is best to use a "feeler" made from a small sheet of paper folded into a four-page folder with the "feeler" inserted between the four pages. The entire thing is placed under the roller and the pressure relieved until the "feeler" can detect the proper amount of pressure on the roller.

Ink Records. These records should be kept in a permanent form for future jobs of similar nature. A record of this kind should always be at the service of the office force that takes care of the estimating.

Register. Every job should carry a nigger-head as a precaution against loss of register. Mark the guides and save the sheet so marked for future reference. Always keep testing for register by running test sheets at given intervals.

If printing plant proprietors would insist upon uniform pressroom operations for make-ready on all cylinder presses there is little doubt that the saving in labor alone would be many times the time required to maintain the system.

Precision and pre-make-ready methods of eliminating or reducing make-ready time work in harmony with a standard press make-ready system. Uniform methods in make-ready for any and all kinds of pressroom equipment return many times in production time the little time required to maintain the standards.

Chapter VII

Micrometer An Aid to Pressmen

Scientific methods of production are now essential in the printing industry. Note the beneficial effects of research and standardization. The standards of printing press manufacturers consider tolerances of one ten-thousandth of an inch in some parts that go into a printing press. Similar care in make-ready should be taken by the printing industry itself.

All parts of the press must be in unison when it is delivered to the printer. Every moving part has received utmost care and attention. This matter of insuring unison, fits and tolerances, is nevertheless more important to the printer, while the press is running on a job, than when it is being tested in the factory. The force required in printing a job may throw the press out of unison. A machinist uses a micrometer to test and check for inaccuracies that may be found in the construction. The pressman, too, should use his micrometer to determine inaccuracies in the material he is using on the press. The pressman should use his micrometer to select the proper amount of packing and the proper height for his plates.

There is greater need for accuracy and unison of bed and cylinder motion while printing heavy forms than at any other time. The micrometer is the best instrument to use in the search for trouble. Use every precaution before the form goes to press. This is the reason for the various methods of pre-printing check-ups (see Pre-make-ready methods by H. W. Hacker) for accuracy used at the present time. It is considerably cheaper to find and eliminate inaccuracies in plates before they are locked in the form and sent to press. The differences between press hour rates and hand hour rates favor pre-make-ready methods from a cost standpoint. Press hour production can be increased. The hand hour rate should be used to accomplish press hour savings.

Everyone in the pressroom or the make-ready division should own and be able to read a micrometer. The micrometer will make the comparable factor one-thousandth part of an inch or, in fact, could make it one ten-thousandth part of an inch. This controlling factor for the industry will raise the standard of produc-

tion and pressroom productivity. The tolerance in the pressroom should be under one-thousandth part of an inch. A human hair measures from one and one-half to two and one-half thousandths of an inch. If we all talked the language of the press-building machinist we would overcome many of our present-day difficulties. The importance and value of a statement based on micrometer measurements is always appreciated.

There are a considerable number of men in the industry who own and use a micrometer daily. Interest in this easily-understood aid to accuracy should be encouraged for better production.

There are several kinds of micrometers on the market. Several are ideal for paper. Some have a spring release that registers the thickness of the sheet after the sheet has been inserted and the spring released. These are very useful. Explanations will cover standard micrometers used in the machine industry—those which consist of a frame, anvil, spindle, sleeve and thimble.

The micrometer is used with considerable success in the foundry type-casting department. Individual letters must of necessity be uniform in body size (type size), set size (type width), and type height (height to paper). These individual type bodies must be the same size at the top of the body as they are at the bottom. If they are not uniform, work-ups are apt to occur on the press after the job has been made ready and is running. It is very important then, that the man running the typecaster check up to see if his type is correct in all dimensions. This is done most effectively with the micrometer. It is generally too late to get results with a job showing work-ups after it is set up. Checking up with the micrometer after the form is running on the press, will give information that can be used for future casting. Work-ups of this nature can be kept down by the various remedies given in the chapter covering work-ups.

For the slug-casting department, the micrometer is also a very useful tool. It is quite important that slugs be kept to the proper height and body size. Slugs will at times vary in type-height. Variations in thickness due to poor trimming of ribs are also likely to occur. These inaccuracies are corrected through intelligent use of the micrometer and necessary mould and knife adjustments.

In the pressroom the micrometer is one tool that is really indispensable. It is the pressman's guide and tells him things he cannot at times see with the naked eye. A type-high gauge helps to cover this need but does not entirely fill the bill. A micrometer may be used in the selection of the proper height of packing for

the press. The combination of packing required by the depth of the cut in the cylinder can best be selected by use of the micrometer. The depth of the cylinder cut can also be determined on unfamiliar presses by building up the necessary thickness in a combination of paper stocks that are to comprise the packing. Paper stock of the heavy kind, such as the usual cards in use today should be measured with a micrometer. Sufficient allowance in packing construction must be made to allow for the proper impression of the card while going over the impression. Every pressman printing a heavy form knows the difficulties encountered when his press packing is too high or too low. This condition causes the top sheet to pull out of the packing or to creep up while the job is running. If the cylinder and bed are in perfect unison while the press is in the printing cycle this trouble with the packing creeping or pulling out is reduced to a minimum.

Bearers should be tested when any difficulty arises and the best tool to use for the testing is the micrometer. Plates, both the blocked variety and those used with patent base, should be tested for accuracy. The base itself should also be measured in order to locate inaccuracies. Overlays (in the packing), underlays (under the form) and interlays (between the plate and block or base) should be checked and recorded in order to keep everything at the proper height.

The planning and estimating departments should always have a micrometer to guide them in selection of various kinds of materials. Paper stocks may be compared for weight with the micrometer by comparing the sheet to be tested with a known weight and kind of paper stock. It is fair to assume that if two paper stock bulk the same and the two stocks are the same kind of paper they will represent the same basic weight. Cardboards and cover stocks may be compared with the aid of a micrometer.

Tests for bulk in books, tests for the number of sheets contained in a lift of paper stock for cutting purposes and many other things can be intelligently compared with the aid of a micrometer.

How to Read Micrometer

The basis of machine screw sizes is first the size of the screw expressed in a standard number for a given diameter, then the number of threads to the inch. These two factors are the means of expressing the standard size screw wanted. The expression "one-quarter twenty" would mean that the diameter was one-quarter of an inch and that there were twenty threads to the inch.

An "eight thirty-two" would mean that the diameter of the screw was number eight and that there were thirty-two threads to the inch. The micrometer is based on the same principle. The one-inch micrometer has forty threads to the inch and each complete turn or one-fortieth of an inch is divided into twenty-five parts, hence $25 \times 40 = 1000$. The micrometers that measure the one ten-thousandth part of an inch have a vernier attachment which is the engraving of ten lines on the sleeve. These coincide with nine lines on the thimble. (See A, B and C in illustration 7.)

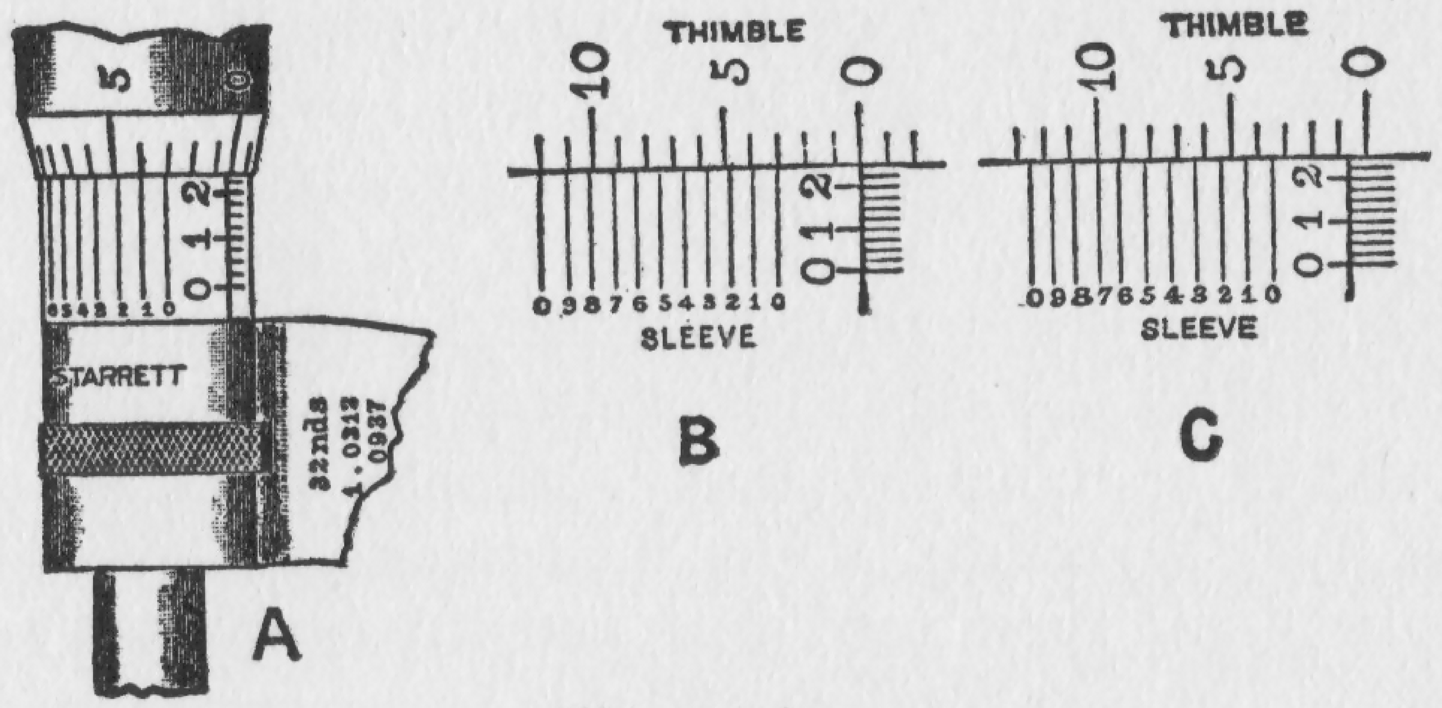


Illustration 7

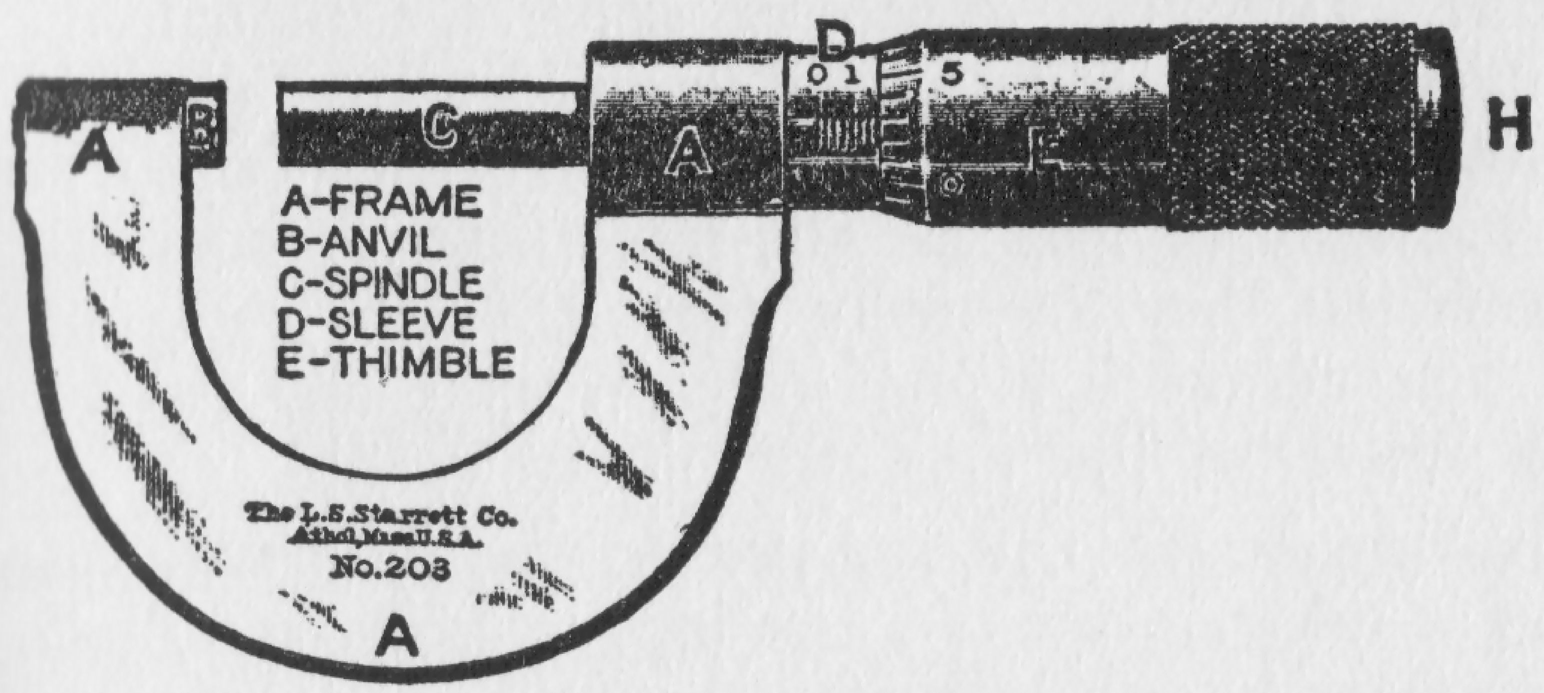
The readings on the three micrometers shown are:
A–.2501; B–.25; C–.2507.

These ten lines on the sleeve are equal to nine lines on the thimble which also represent nine one-thousandth parts of an inch. Hence, each space on the sleeve represents one-tenth of one-thousandth or one ten-thousandth part of an inch.

The micrometer consists of A–the frame, B–the anvil, C–the spindle, D–the sleeve and E–the thimble. "H" shows where the ratchet is attached. (See illustration 8.) The measurement is made by placing the article to be measured between the anvil and the spindle. The reading is taken off the sleeve and the thimble.

There are forty lines on the sleeve, each line representing twenty-five thousandths of an inch or one complete turn of the thimble. Each fourth line on the sleeve is marked from one to ten and each represents one hundred thousandths of an inch. To read the micrometer, count the number of vertical lines on the sleeve exposed by the thimble and to this add the number of additional thousandths shown on the thimble. Count the number of thousandths by starting from the horizontal line on the sleeve and count from the zero mark on the thimble from the bottom up to the horizontal line on the sleeve. Each five lines on the thimble are numbered to facilitate the operation of counting the number of thou-

sandths to be added to the thousandths exposed by the thimble moving away from the zero on the sleeve. If the zero on the



Illustrations by courtesy of L. S. Starrett Company, Athol, Mass.

Illustration 8

The reading on this gauge is 178 thousandths of an inch

thimble is above the horizontal line on the sleeve, count the individual thousandths by going over the top and around the thimble. Note in illustration 8 there are just seven divisions exposed on the sleeve, each representing twenty-five thousandths or one hundred seventy-five. There are three vertical lines on the thimble counting up from the zero to the third line that is directly opposite the horizontal line on the sleeve. Hence, 175 plus 3 equals 178 thousandths of an inch.

Reading Ten Thousandths

In reading a micrometer that has the vernier attachment (see illustration 8) the operation is the same and the ten-thousandths are added to the amount of thousandths in the total reading. The addition of these ten-thousandths is decided by noting the line on the vernier that corresponds with any vertical line on the sleeve and this line represents the number of ten-thousandths that must be added to the total of thousandths shown on the previous reading. The vernier attachment represents the horizontal lines around the sleeve and above the main horizontal line on the sleeve. As previously explained these ten lines in the vernier correspond with nine lines on the thimble and each line is numbered. This number becomes significant when the lines in the vernier and the thimble are directly opposite each other.

In the illustration 7, C, there are 250 thousandths represented in the exposed lines representing the sleeve, because there are nine lines exposed and the tenth one is about to be exposed as soon as

the thimble will be moved to have the zero correspond with the sleeve horizontal line. The vernier is opposite the seventh line in that the "10" on the sleeve and the "7" on the vernier are opposite each other. This, then, represents seven ten-thousandths of an inch and the entire reading would be two hundred and fifty-seven ten-thousandths of an inch. Micrometers which do not have the vernier can only be used for the measuring of thousandth parts of an inch but they are really dependable for the printing industry. The vernier is a good thing to have and can be put to good use where the finer measurements are needed.

The best investment that any printer who deals with machinery can make is the purchase of a one-inch micrometer caliper. With this instrument he can look into the field of minute detail concerning his every-day problems and solve them by taking cognizance of the fact that the tell-tale discrepancies can be measured and suitable adjustment be made to eliminate them. Precision and pre-make-ready means improvement in the printed product.

Some micrometers have a locking device which is located in the frame and clutches the spindle at any given setting. Hence, this type of micrometer may be used for a type-high gauge by setting the caliper at .918 and locking the spindle in this position. Some micrometers also have a ratchet attachment which is placed in the thimble at the point indicated by "H" in illustration 8. This ratchet is made to apply sufficient pressure on the spindle to give the proper reading and when any greater pressure is applied the ratchet slips over the teeth and has no effect on the spindle and reading. Care should be exercised in closing the spindle on any object to be measured because it is possible to force the micrometer beyond the proper pressure point and thereby get an improper reading.

The proper way to hold the micrometer to facilitate use and reading is as follows: Hold the micrometer in the right hand and the object to be measured in the left. Slip the fourth finger (pinky) into the space made by the curve of the anvil. Rest the thimble of the micrometer on the second and third fingers and use the thumb and index finger to turn the thimble to open or close the spindle. In this way the micrometer can be slipped on to the object to be measured which is held in the left hand closed to the proper pressure and the readings taken from the sleeve and spindle, which is face up in the right hand. A little practice will make one expert in the use of a micrometer and the result will be a better understanding of all materials and supplies purchased.

Chapter VIII

Close Register

The guides and grippers are the most important part of every press demanding register. The position of the guides, grippers and shooflies is an important factor in getting and maintaining register on any cylinder press. Of course, there are other factors that control the register of a press. Few of these need as much watching and adjustment as the drop guides and side guide of a cylinder press.

Every job should be in register regardless as to whether it is a one or more color job. On one-color jobs registration is an important factor, if the future possibilities are kept in mind. Many a job that required an additional impression for inserting a broken letter or a battered line could have been salvaged from the "bag" if the press had been put in register and the job checked occasionally for assurance. Maintaining register on a properly adjusted press is the pressroom executive's "ace in the hole" when something unforeseen happens to the job.

On close register work, the marking of the exact position of both drop guides and side guide is important. This is especially so on hand-feed presses, where the side guide may be set at varying distances from the gripper edge of the sheet. On automatics the side guide is always the same distance from the gripper edge of the sheet. Side guide whether near guide or far guide should be marked by a nigger-head. The position of the drop guides is important on all classes of cylinder style presses.

"Split roller" work, which generally requires a work, twist, tumble and twist manipulation of the sheet printed on two sides in two colors, overcomes the drop guide position difficulty by cutting this drop guide position in the back edge of the sheet when the first printing impression is taken. The side guide position is taken care of by placing the guide as near the center of the sheet as is possible to place it. When paper stock purchased for this kind of work is not sufficiently square to insure perfect register, the stock should be squared in the cutting machine. The two squared edges should be marked and used for guide and gripper edges on the press.

The success of the wax plate method (two forms, down and cross rule run work and twist) of printing on the job press depends largely upon the exact squareness of the stock, as all sides are used for the guides in this kind of work. Trimming the stock on all four sides does not mean that the stock is square. The side and back guide of the cutting machine may not be square, in which case the stock would be out of alignment because all sides would not be perfectly square to each other. The proper way to square stock is to cut it to a block. On sheets that can be trimmed on all sides, as for job presses, it is advisable to place the sheet against the block, which takes the place of the back gage, and against the side of the cutting machine. The first cut, then, will be at right angles and square with the side placed against the side of the machine. This cut edge is then placed against the side of the machine and against the block, and so on until the entire sheet is cut to the proper size and square.

If the side of the cutting machine is not squared with the cutting edge, no sheet will be cut square. Almost all machines, however, have sides which are squared with the cutting edge of the knife. In any case the block feature takes care of the irregularity in the end of the stock. Stock for cylinder press, work and turn jobs, that require squaring need only to be squared on one end and one side of the sheet. This is easily accomplished by cutting to a block and using the cut end for the side guide and the side of the sheet against the side of the machine for the drop guide or gripper edge.

When jobs are printed that will later be die-cut, especially by the high-die method, it becomes absolutely necessary for the printer to keep the job in perfect register as well as to have his guides and gripper positions marked. A finisher who is to die-cut a job knows that the job will be ruined if the register is not perfect. Such a case was a job printed in one color on gold paper about 3 x 5. There were ten labels on the sheet. A sheet this size is difficult to hand feed to perfect register, and this job was no exception. The job was padded to insure proper register in die-cutting and the top sheet on the pad was about one pica out of register. If this top key sheet were used to die-cut this pad, the top label would have been cut perfectly, but all the balance of the pad (about four hundred labels) would have been spoiled. Our opinion in the matter was solicited, and we decreed that there were only three ways out of the difficulty.

1. Reprint the entire job and check up for register.

2. Pin the present job, which required slow and accurate pinning of each sheet, and then cut and pad for die-cutting.
3. Die-cut the present job, checking up to see that the top sheet of the pad was one that registered and then assort the labels to eliminate those of poor register. The third suggestion was followed and the job was saved with a small added expense for assorting the labels.

There are times when close cutting of labels, which have been run on a large sheet, requires pinning before trimming. This is tedious and expensive, but when close register is required it is most effective.

Slitting to Perfect Register

One printer with whom we once had the privilege of contact had only two cylinder presses in his plant. One of these machines was size 28 x 44, the other 38 x 50. On certain kinds of two-color work, which fitted the conditions, a 38 x 50 sheet was printed on the large press. While the sheet was being printed and still held by the grippers, a cutting reel, which was fastened to a bar and which, in turn, was bolted to the frame of the press directly beneath the feed-board, would slit the sheet at right angles to the gripper edge. A steel tape about one-half an inch wide was fastened to the cylinder of the press and acted as a base against which the slitter operated. The sheet was slit to size 25 x 38 while still held by the grippers and this made it possible to use the slit edge as the gripper edge on the small cylinder on which the second color was printed. A similar device is now on the market and can be had through printing supply houses such as American Type Founders. Tricks of this kind are effective and practicable, but a battery of similar size presses is the easiest method of production.

Cutting sheets of a two-color job apart on a cutting machine after one color has been printed and then printing the second color on the smaller size sheet, is a precarious thing to do. It is dangerous, even if the first color is only a border on which a type page is to be printed. Loose leaf sheets or pages may sometimes be attempted in this way. It is dangerous to cut these sheets apart and "lose the guide," because the margins of the page cannot be kept uniform. This is obvious when the knife pull on the guillotine cutting machine may vary from one to three leads between the top and the bottom sheet of the lift. The difference is sometimes greater because of the roughness of the paper stock and the dullness of the knife.

A type specimen book in loose leaf form was run in this manner. A red border was printed four pages up on a Kelly press, then cut apart and printed two up and one up. The border sheets were printed in specified quantities and then imprinted with the various type face combinations. Apparently no attention was paid to the proper margin on the pages when cut apart, with the result that there was a great variation in margins when several of the sheets of different "cuttings" were gathered into one book.

The condition became serious because many thousands of pages were printed awaiting gathering and few of these pages had uniform margins. Finally the device of using a template showing a uniform margin was decided upon. (See illustration 9.)

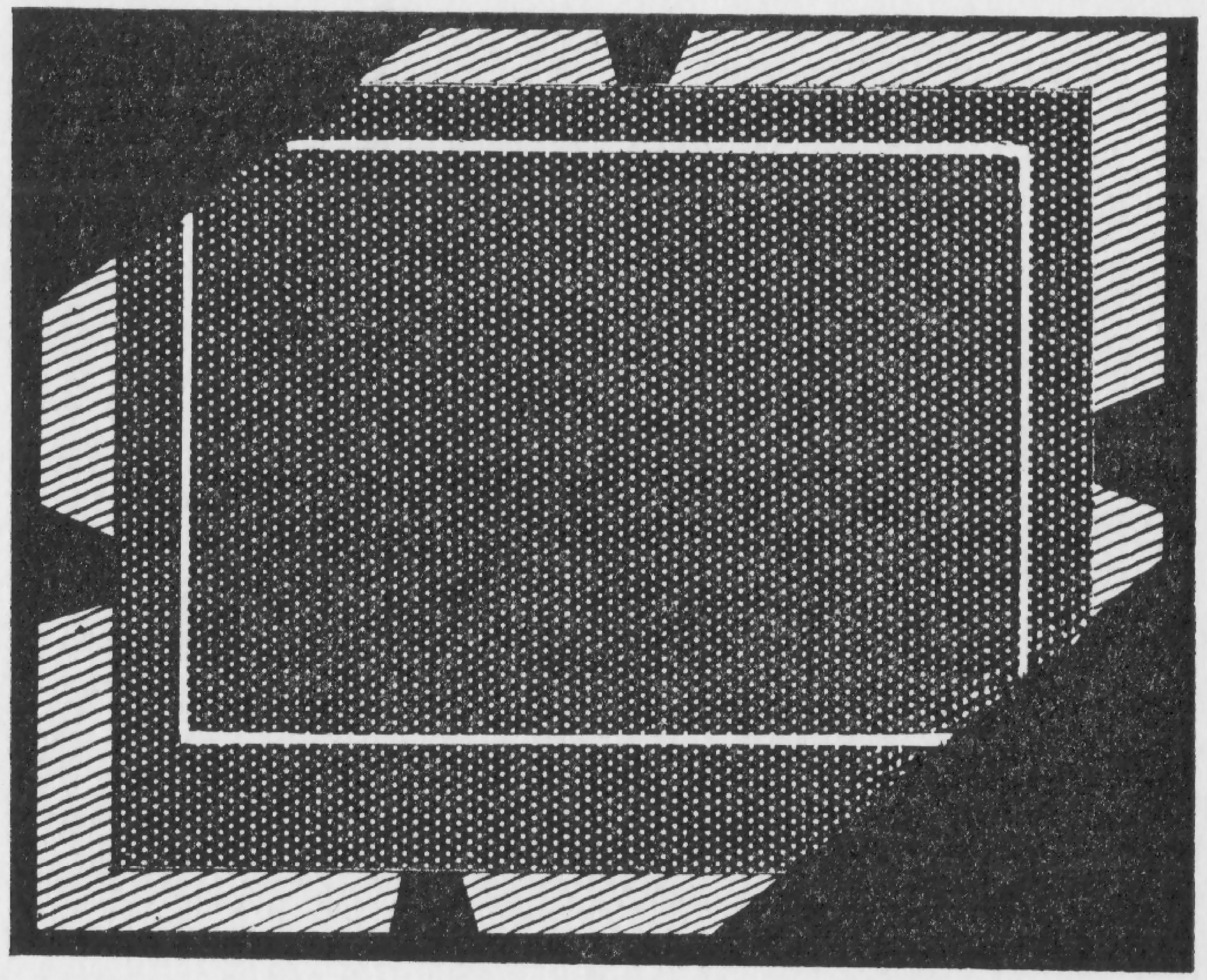


Illustration 9

Template for guide in trimming pages with uniform margins. Note the corners cut off to use rule border as guide in stabbing sheets for trimming guide shown in notches on each side of the sheet.

This uniform margin was a tiny bit smaller than the original margin. This permitted the pages to be pinned, "stabbed" and trimmed according to the template. Uniform margins were again available at an additional cost, but not as great a cost as if the job were reprinted.

Register on Color Work

All color work demands perfect register or the job will be

ruined regardless of all other assets contained therein. Typography, color of ink, stock, folding and all the other factors may be perfect and yet the job will be ruined if it is out of register.

Rush work is the biggest offender and greatest source of spoilage liability. One salient thing about rush work is the fact that while delivery is the major consideration of the customer when the work is in process immediately upon delivery his attention is transferred from delivery to quality and there it remains. It is poor policy to rush a job through to completion and overlook the feature of quality. Quality is a factor which gives a permanent rating to the ability of the shop and the individual producing the job. Time is the variable factor which is important only at the time of preparation and production and which vanishes at the moment of completion. The excuse that the job was in a rush "explains but never excuses" a printer for delivery of a job that does not register.

Register is affected by a number of conditions, of which some are controllable by the printer and others are not. The chief factors are: A—Condition of press equipment; B—Press adjustment; C—Kind of form; D—Wrinkles; E—Tacky ink; F—Atmospheric effect on paper stock.

Condition of press equipment often determines the result on a register job. Every press should always be kept in the best condition so that any kind of register job may be run on it. On job presses all bearings and cams should be kept properly adjusted. Tympan bails should be square and tight at all points. Grippers should be straight and set to apply even pressure on the sheet to hold it securely against the bed of the press. Guides for the platen press should be securely fastened to the top sheet.

On heavy card stock it is advisable to use sealing wax and quads. On particular register work it is also advisable to put two sets of quads in each position. The second set should be placed directly behind the first and original set of quads. When the original guides become loose or fall off they can easily be fastened again in the original position by placing against the second set of quads.

Press adjustments for register on cylinder or flat bed presses are also important. No mention is made of the register rack because this is considered a machinist's adjustment. A good test to check register on cylinder presses is to place the form on the bed, lock it on in the regular way, dress the cylinder and pull several impressions on the top sheet. If these impressions are in

perfect register it proves that the press is in register and that it is only necessary to make the proper adjustments on the guides, grippers, hands, and brush in order to keep the sheets in register.

Grippers should be set allowing about a 2 point lead between the tumbler and the tumbler rest pin. Grippers set to a block are usually set without the 2 point lead. Grippers may be set from the center out toward the ends, although this is not essential. Care should be taken with the shoofly fingers because they sometimes cause the sheet to be thrown out of register through causing slight buckles in the sheet.

The adjustment of gripper guides is the most important adjustment on the press. If these guides raise too quickly and there are no hold-downs on the press the sheet is momentarily left without security and may move out of register at this point. If guides lift too slowly they cause a slight tear in the sheet at the guides. The most effective way to set these guides is to slow them up with the press running until they cause the sheet to tear, then raise them until they stop tearing or nicking the sheet. These adjustments are made on the side guide arm and must take into consideration the motion of the press.

The bands are always set when the cylinder is down and on the printing cycle. They should be set from the center out and with enough pressure to hold the sheet snugly, but not so tight as to drag it out of the grippers. Bands should be in perfect contour to permit of fitting the cylinder.

When a sheet drags out from under the grippers some think it advisable to glue a small piece of emery cloth under the grippers. This is glued in a strip exactly as wide as the gripper itself. The top sheet may be cut out in order to allow for the thickness of this emery cloth. When this piece of the top sheet under the gripper is cut away the emery cloth is glued underneath the top sheet. Some pressmen declare emery cloth is not needed as the function of the grippers is to hold the sheet with even pressure without the aid of an abrasive.

The brush is set up close to the cylinder when the cylinder is in the printing cycle, the same as are the bands. Sometimes a brush is built up in the center in order to smooth out the sheet and wrinkles while the impression is being taken.

On cylinder style job presses we find that conditions similar to those on the flat bed prevail. Adjustments vary slightly, but the fundamental principle is the same and may be applied with the same success as on cylinder presses.

One of the most important adjustments on the cylinder style press is the arrangement of the gripper "bite." If too great a gripper margin is used on the job the gripper in its closing movement will push the sheet away from the guide before the grippers close and in this way affect the register of the job. It is always best to have a gripper bite on the job that will not allow the sheet to extend over the cylinder edge.

Imperfect register caused through physical changes in the sheet is best corrected by controlling the atmospheric conditions in the plant. A sheet of paper stock will absorb 85 per cent of the moisture it can normally carry within three minutes after exposure. If the humidity or moisture content of the atmosphere in the plant is higher than the stock room where the stock was last exposed, the stock will absorb the moisture and stretch accordingly. If the reverse condition prevails, the paper stock will dry out and shrink accordingly.

Printing plants that do not control the atmosphere must protect the paper stock or sheets both before and during production. Sheets that are being printed will change in approximately the same way during the time required to go through the press and reach delivery provided, of course, that the atmospheric conditions remain the same. The pressman, then, must keep his stock covered at all times. If he will do this, he will eliminate spoilage through misregistration. Otherwise the top twelve or fifteen sheets in all piles or top of each racked job will be out of register. The top sheet will be out of register the greatest distance. Each succeeding sheet will be closer to perfect registration until the twelfth or fifteenth sheet will be perfect with all the following sheets until another "top of the pile" is encountered.

Paper stock stretches most across the grain of the sheet. For this reason the difficulty encountered in keeping the job in register will be with the plates that run across the grain. The sheet will change with the grain also, but it will not change as much in this direction as it will across the grain. For this reason the plate at the further point from the gripper and side guide will be out of register a greater distance than the other plates on the sheet.

Stretched or wavy edges cause trouble in keeping the job in register. These edges cause minute wrinkles which change the position of the sheet being printed so that the plate thrown into the wrinkle will not register. Wrinkles change margins in size

and position and changed margins mean "off register" jobs.

Tacky ink affects register because it may cause the sheet to be pulled out of the gripper while being printed. This condition may fool the person running the job because all sheets will be pulled out of the grippers to the exact same distance. When this condition prevails and all sheets are pulled out the same distance the register on the job will be uniform. In those instances where the press is tripped and the form double or triple rolled the excess amount of ink on the form affects the register. This excessive ink when tacky will pull the sheet out of the gripper to a greater extent than the normal amount of ink and in this way throw the sheet out of register.

The kind of form or rather the physical make-up of the job will affect the register. Forms that have large open areas in them require more attention in maintaining perfect register because the sheet must be kept perfectly flat and free from air pockets. Air pockets change the position and margins in the same manner as wrinkles, as previously explained. Embossing forms, that have considerable paper or space between plates, are difficult to keep in register because of the change in margins between the make-ready and running conditions when the periphery of the cylinder changes.

Quoins at Back Edge

Methods of putting the form in register on cylinder press on blocked electrotype or type forms vary considerably. There is some dissension as to which end of the form gripper or back edge should receive the quoins. Of course, on patent base forms, this difficulty is not encountered, but on blocked forms the item of registration is an important one.

Some experts have decreed that the quoins should always be at the gripper edge of a cylinder press form to insure a solid back edge because of the pressure concentrated at the back. If this is done the time required to register the form is greater than the time required to register a form with the quoins at the back edge.

For economy and ease when registering a form on the bed of the press it is best to have the quoins at the back edge. The gripper or front edge of the form should be solid. The form should be locked up in perfect alignment with the two gripper guides on the feed-board. The sheet to be printed is squared up on the press guides and the form should be squared up to the

sheet. The guide edge of the sheet and the gripper edge of the form should always be kept in alignment. Quoins at the back edge of the form will allow for this condition. Quoins at the front edge will throw the entire form out of alignment with the guides every time the form is unlocked. Kelly presses with the gripper edge to the inside of the bed are the exception to this rule.

In registering the form to the colors already printed on the sheet we open the quoins at the back of the form and start at the gripper edge to register all the plates contained in the form. Each plate is marked as to the number of leads needed in the shift. All moves are made and the quoins locked and another sheet pulled and marked for moves. The quoins at the back edges of the form are opened far enough to make the moves required. If the gripper row of plates are in register the quoins do not affect this row because they are not opened far enough to change their position. In this way each succeeding row of plates is registered until the entire form is completed. Each time the quoins are opened they are opened only enough to make the desired move and the balance of the form is unmolested.

Compare the previous description of registering a form with quoins at the back edge to the problem of registering the form with quoins at the gripper edge. When we pull the sheet for register and mark the moves required we open the form at the gripper edge and make the moves.

This is done every time we pull and mark a sheet for moves into register. Every time we open the form with the quoins at the gripper edge we throw the entire form out of register with the guides on the feed-board and must then rely upon our own knowledge as to how much we must lock the quoins in order to get the form back into the proper position. Even when chalk marks are used on quoins it is difficult to get the form back into the exact position when the unit of exactness is one point or one-seventy-second of an inch. Since the entire form is thrown out of register every time it is opened more time is required to get the form back into register. Hence, our contention that the use of the quoins at the back edge of the form is most economical in time and effective in accuracy. We believe that keeping the gripper edge in alignment with the guides on the feed-board is the most important factor encountered in registering the form. This can only be done by placing the quoins at the back edge of the form.

Chapter IX

Printing Water Color Jobs

Constant progress has been made in printing water color ink jobs by letterpress process. The results often are little less than startling. Brilliance of color and softness of finish have caused many printers to study how these effects are achieved.

The introduction of molded and hand cut rubber plates in this process permitted the letterpress printer to obtain effects never dreamed of a few years ago. The rubber plates have done away with the necessity of pounding rough paper stocks with excessive impression in order to get the plate to print. For this same reason there has been a slight reduction of make-ready due to the resiliency of the plates. However, plates for water color printing purposes are not invariably made from rubber. No one kind of plate will answer all purposes, and so water color jobs have been run with zinc, copper and steel face electros as well as the rubber plates first used. Screen plates have been used successfully, but screens over one hundred lines to the inch do not work as satisfactorily as the coarser screens in this process.

The kind of stock to be used on the job will help decide the kind of plates to use for printing. Water color ink works well with rubber plates and such plates do not disturb the texture of the stock. Hence, when the texture of the paper is to be retained, the rubber plate should be used. Mat finish papers always work best with water color ink. Antique, machine finish, English finish book and super papers work well, though when smooth paper stocks are to be used, it is possible to use metal plates. Water color ink should not be printed on coated stock as the color of the ink is slowly changed by the content of the coating on the stock.

Art work is selected to suit the subject. The artist selected should understand the possibilities of the water color ink process and adapt his work to it. In this way the work can be produced more economically. Plate cutting can be facilitated and register maintained more readily when these items are given consideration in the art work.

The inks used by the artist have direct control over production of the work and the final color combination achieved on

the job. Opaque inks are necessary when the artist uses opaque colors in his sketches. Transparent tints are reflected in the artist's thinned down colors used in the art work. Rubber plate reproduction of artists' line drawings must consider faithfulness in reproduction and the running of colors to match the artist's interpretation generally requires opaque or pastel color shades of ink when used in the art work.

Register requirements on rubber plates call for great care in press preparation and make-ready. The artist's color overlays are used for guidance in cutting (hand-cut) plates. Zinc line plates are sometimes used for the key plate and color plates are cut from transferred proofs of this key plate. This method of cutting plates places the responsibility for register on the ability of the plate cutter. There are times when zinc original line plates are not required. A key form may be made from a photostat print which acts as the key plate. Photostats change in size because they are soaked in developing solution and this moisture naturally changes the sheet size of the print. For this reason the photostat method must be carefully watched while the plates are being cut.

Rubber plate stock is carried by supply houses in various sizes up to 36x72 inches. If desired it can be secured, mounted on a zinc base which is beveled and ready for use on a patent base.

There are two kinds of hand-cut rubber plates—one made from hard, the other from soft rubber. There also is an oil-proof rubber on the market, made especially for oil inks. It is claimed this rubber will stand up for 50,000 to 100,000 impressions. This, of course, is dependent upon the kind of plates, and the type of press, ink, stock and the care used in make-ready. Rubber plates have been known to run only a few thousand impressions, after which a new set of plates were required. Circumstances alter cases. Molded rubber plates are being made to the printers' satisfaction. Halftone plates of molded rubber are also a reality.

When electros are to be used in water color printing, the platemaking is the same as for any color job. Line plates and halftone screens are handled the same as for oil inks, except that screens must conform with both ink and paper requirements.

Make-ready is very important. It often spells success or failure for the job. A light "kiss" impression for form and roller setting is absolutely necessary at all times. Never use excessive impression just because the resiliency of the rubber absorbs the squeeze. The rubber plates will be easily ruined if the plates are not exactly type-high (.918 of an inch). Over-packed or under-

packed cylinders distort rubber plates and tear them to pieces. Ruination of the plates takes place in the form of a porousness or pitted condition. Make-ready for metal plates is similar to oil ink methods.

Successful printers with water color inks have insisted upon a set of progressive proofs the same as presented by the photo-engraver for guidance in the pressroom. This precaution is a "safety valve" to insure satisfactory results.

Registration in rubber plate making is always a factor. At times it is necessary to cut (hand-cut) the plates into register when colors overlap. Excessive impression will distort rubber plates and pull them out of register. Hence, the previous admonition regarding a "kiss" impression.

Water color inks can be superimposed in the same manner as oil inks. It is necessary to have a heavier body ink on the first color of a two-color press when printing water color inks just the same as oil inks. Ink body consistencies are thinned down or made heavier and are handled exactly the same as oil inks. Of course, different reducers are used to conform with the glycerine base for water color ink.

The August Becker Corporation of Brooklyn, New York, has applied for a patent on a system of color overlapping. This corporation is a Jean Berté Process licensee. One of the August Becker charts shows a combination of fifty-six colors obtained from overlapping six basic colors.

Oil ink will print satisfactorily over water color ink. Water color ink does not print satisfactorily over oil ink. Offset becomes a serious problem when water ink is printed on oil ink. The water ink, too, shrivels up when it comes in contact with the oily surface of an oil ink impression.

One of the beauties of water color inks is the possibility of printing one color on top of another without the customary sheen which comes with oil base inks when superimposed. Mat surfaces of brilliant solid colors make water color ink jobs an "advertiser's desire" because they attract attention.

Water color ink sets immediately. Tint colors, which are generally transparent, dry within the hour. Opaque inks require about six hours to dry. A blast of air from a fan will facilitate drying of water color inks most effectively.

Light colors in water color ink production may be run first or last. As a rule the black is run last. This is generally an oil base ink and for this reason is run last, but light colors may be run last if required. Oil process colors permit any sequence of color production provided transparent colors are used. Water color inks permit of light colors printing over previous colors in the same way.

Rollers an Important Factor

Rollers are an important factor in water color work. Regular printing rollers consisting of glycerine, glue, and molasses compound have been used with satisfaction. A hardened, well-seasoned printer's roller moistened with glycerine makes a good roller for water color ink printing. Rubber rollers are also used with success. In a similar way copying ink production of years ago always used regular printer's rollers for the purpose and the glycerine base of the copying ink conformed with well-seasoned rollers that had all tackiness removed with an application of talcum powder.

Water color inks are generally colored with water soluble dyes. These dyes penetrate into the glycerine-content printing rollers. Dark colors hidden in old rollers tint light-color inks while running. This darkening of tints is a slow process and difficult to detect. Whenever possible, it is suggested to keep one set of rollers for each of the yellow, red, blue and black inks as does the lithographer, who has similar color tinting conditions with which to contend. Various shades of tints fall into their basic color for roller classification. Tinting of colors on press runs, of course, makes it difficult to maintain a uniform color on the job. Several washups are sometimes required to eliminate the difficulty and there are times when the trouble cannot be overcome because of the tonal strength of the old ink contained in the roller and the delicate tint being printed. Hence, the suggestion to keep a set of rollers for each color when possible.

A second suggestion to avoid tinting is to keep the sequence of colors being printed in strict conformity and have each succeeding color governed by the tonal strength of each one of the inks. This procedure must be carefully watched during the printing of progressive proofs which represent the pressroom guidance during production of the job. It is hazardous to attempt to run a color job in a different sequence of colors than shown in the progressive proofs. To do this, spoils the pressman's color guide during the entire run. Four color jobs are sometimes run in a different sequence than shown in the progressive proofs and when this is done the pressman must understand and appreciate color combinations in order to visualize

the effect of the additional colors upon the one or two colors being printed. Register and color combination requirements sometimes make it advantageous to run red and blue together or yellow and black together even though the progressive proofs were run yellow, red, blue and black.

Water color inks are at times very tricky. What you may show the customer and have O.K.'d in the morning may be entirely different in the afternoon. For this reason a considerable allowance must be conceded to the printer in regard to colors in this process. For the same reason also the printer should prove up the job and keep the progressives for his guidance while the customer may O.K. the finished proof for his own interpretation of what he expects from the printer.

Water color inks have considerable brightness. Their brilliance, no doubt, is accountable in no small degree for their success. The body vehicle is generally glycerine and, as we have noted, the color is often a water soluble dye. The color strength therefore can be controlled to a greater degree than the dry color pigments and boiled linseed oil varnish vehicle used in oil inks. Density of color gives water color inks their vivid hues.

Opaque and Transparent Inks

Opaque and transparent inks are both made in water color inks. Tints made from reducer and color carry a greater transparent quality than the opaque inks, although the light colors are more opaque than the oil base inks. It is possible to print dark colored papers with light color water base inks with one impression.

Pastel shades are possible in water color inks. They are very tricky because the pastel effect is not discernible in the wet ink. The pastel shade effect gradually blends into the ink while it is drying. This takes from six to eight hours. Oil inks generally dry lighter in color than the ink shown while it is wet and water color ink has this same tendency, but in a greater degree. The colors in water color inks generally dry out a few shades lighter.

Water color ink absorbs moisture. Humidity, therefore, affects the ink by the constant absorption process that goes on during the printing period. Ink consumption is not as great with water color as it would be with oil inks under the same conditions. Oil inks require more ink to cover antique paper than does water color ink which reaches down into the pores of the antique stock through the resiliency of the rubber plate

used in the printing. The exact amount of saving in ink consumption has not as yet been ascertained but it is agreed by those who handle it that at least a ten per cent greater coverage is possible with water color inks than is possible with the same colors in oil base inks.

Chapter x

Two Colors on a One-Color Press

The value of color in advertising has naturally increased the color demands made on the letterpress industry. Many of these color work press runs are of medium quantity and are handled on one-color medium-sized presses. Much of this kind of work is being done on small job cylinders. Large slow running cylinder presses are being replaced with small fast running jobbers.

Print shops that can produce two-color jobs on one-color presses have no problem on their hands when delivery on two-color jobs is demanded.

When a two-color job can be printed in one operation it means that completed copies can be delivered in a few hours after the job has started to run.

Economy, too, is an important factor in this method of printing two-color jobs in one operation. On jobs large enough to print on a medium size press it is sometimes possible to save the expense of electrotypes as well as saving half the number of impressions. If and when two-color engravings are furnished in complete form they may be locked up in one form and printed both in one operation.

Any pressman who has an appreciation for minute detail may accomplish satisfactory results in this speedier, less-expensive method of production. A cylinder style press is to be used in this demonstration because this type press is best to explain the principles involved. Of course, this method can be used on the other types of presses that permit of using the same method of production, that is, presses constructed on the same principle as the cylinder.

The method of production is simple because the necessary work involved consists only of operations with which the printer is thoroughly familiar. Meticulous care in preparing the press for the run is absolutely necessary. Diligent care must govern all operations and care will insure success.

Economy especially in producing poster work or broadsides (when run on one side only) is very noticeable. Double the size

sheet may be run because the form contains two individual forms, one of each color locked up in the same chase.

The equipment necessary to do this kind of work will be found in any print shop. It consists of a divider for the fountain, two pieces of cutting rule about four inches long, two pieces of brass rule about five inches long and two points thick in body measurement and some LePage's glue. These items together with the knowledge of the ordinary pressman and compositor are all that is necessary to do a good job.

This process begins in the composing room with the lockup of the form. For example, consider the job of printing a window poster size about 18x24 in two colors, red and black, on one side of a litho coated stock, quantity about 10,000. The job is to be run on a 28x42 press. The plates are to be furnished and the job is to go to press immediately upon the receipt of the plates. The "rush" condition will not permit of time for electros and copies are wanted immediately.

This particular kind of job may be run two up, one red and one black form by our method and copies delivered with utmost speed. The plates would be locked in one chase with one middle bar if the margin permitted. They would be locked up head to foot so as to permit the proper register when the sheet was twisted for the second time through the press. This kind of form would be printed as a work-and-twist, that is, the sheet is printed twice on the same side which is done by swinging the sheet around, first using one of the long edges for the gripper and then using the other long edge for gripper on the second printing. This feature of using two edges for the gripper makes it necessary to have the sheets squared up on three sides, that is, the two long sides and one short side which will be used for the side guide. After the margins are known the cutting rule is inserted in the back edge of the form at the exact distance from the edge of the form as designated by the margin.

If the margin is to be two inches all around the poster, these cutting rules are to be locked up two inches from the form and at the back edge. It is best to make an individual lock-up of these two cutting rules so they may be lifted out of the form when the first side has been completed. The rules will have completed their usefulness when the first half of the run is completed because they are only used to cut the gripper margin for the second time through the press.

Be sure the cutting rules are .918 of an inch or type-high. This type of rule is generally used for cutting exclusively and generally is somewhat over type-high. This is a very important feature and may be the difference between a successful job and a failure. This cutting rule must not be over type-high because all parts of the form must be type-high to insure satisfactory results when running the job. If necessary have the cutting rules ground down at the base to type-high by a machinist, but be sure to tell him that type-high means .918 of an inch.

While the form is being locked up on the stone the stock should be trimmed down to size 36x24⅛. The ⅛ inch is left on the sheet to permit of cutting a gripper edge in the sheet. The cutting rule should cut the gripper edge for the second time through the press about ⅛ of an inch from the back edge of the sheet. When the first half of the run is completed the back edge of the sheet will have a slit running parallel with the long edge of the sheet at two places representing the drop guide position for the second printing. These slits will be about four inches long, in fact as long as the cutting rule being used. After the first half of the job is printed the strips ⅛ wide and 4 inches long caused by these slits should be torn out of the sheet and the sheet again run through the press, this time using these slit cut-outs for the guide margin. This condition will allow about ⅛ more margin for the gripper than was used on the first time through the press. This can be adjusted, however, and should not interfere with the job. After the job is completed as far as the presswork is concerned the ⅛ extra margin is trimmed off the sheet and the sheet is ready for the binder or any other destination necessary.

Press Preparation

While the paper is being trimmed and the form is being locked up the press is being prepared for the job. The first thing to do is to cut the rollers. This should be done in conformity with the vibration of the rollers and this must be curtailed so that they vibrate within about one-half an inch. Stop the vibration at this point so that the rollers will only vibrate the required distance. It is not well to stop the vibration entirely because this condition will not permit of good printing. Vibration is needed to help break up the ink and distribute it over the entire form being printed. After the vibration is adjusted the rollers should be cut about one inch off the center of the press, and either side may be chosen as off-center. This is done to permit the continued use of these same rollers on other jobs that are not run split roller fashion. All that is needed to use these same rollers for other jobs is to change these rollers end for end and put an uncut roller in number one form roller socket.

The rollers should be cut sufficiently deep and straight to permit the running of two colors of ink close beside each other without blending together. The width of these cuts in the rollers should be about ¼ inch wider than the extreme width of the vibration. All rollers are adjusted for vibration and cutting, including the form fountain and angle rollers.

The next operation would be the placing of the fountain divider in position to conform with the cut in the rollers. Care should be exercised that this divider does not permit the black ink to flow underneath and into the colored ink. The divider must also allow the setting of the fountain with minimum effort on the blade. This can be done with a little practice. With the rollers and fountain all prepared, attention is given to the form. The form with the two colors locked in it is placed on the bed of the press, loosened up, planed down and locked securely—the chase to the bed of the press and the form in the chase. The press is then packed in the regular way and an impression is pulled for register. The cutting rule should be printing now and it is necessary to cut out each slit with a make-ready knife until the form is underlayed and registered. The job should be in perfect register before an attempt is made to start running. Of course, the make-ready is done the same way as on any other form.

It is best to line-up the key form first, then register the color form into this first form. The color form is generally the lighter form of the two forms to be printed. As before said, the forms must all be in register before the job is started. It is poor policy to attempt to leave some minute moves required for perfect register until after the first side is run. Get the entire form into register before the job is started and then the job may be backed up at any time desired without further registering.

After the form is registered and made ready it is necessary to affix the brass rule under the top sheet in such a way as to insure perfect cutting and permit the lifting of the top sheet at any time without interfering with the job in any way. This is done by glueing the brass rule to the bottom side of the sheet. This protects the form from the brass rule should it become loose. The best way to fasten this rule with the glue is to apply

the glue to the rule in a generous quantity and then rub a finger across the glue and draw it about twelve inches from the rule, this will break the glue into minute strings and when the glue is stringiest it is at the height of its adhesive power. When this stage is reached, fasten the rule to the bottom side of the top-sheet and rub it down securely from the top side of the sheet. The 2 point brass rule is .277 of an inch thick. This cutting rule must be made ready the same as any printing part of the form. The proper way to make-ready without any excessive impression is to cut enough sheets out of the packing underneath the brass rule to get the cutting rule to print without any impression. Then cut the top sheet away from the impression on the brass rule, have it clear the impression about ⅛ inch both sides and end. Proceed to make it ready so that it will cut only one sheet clearly. *Don't put one excessive sheet of impression on the cutting rule.* Make it ready with tissue if need be. If the job is started with too much impression the rule will finally bend and the cutting will be impaired and the register will be lost.

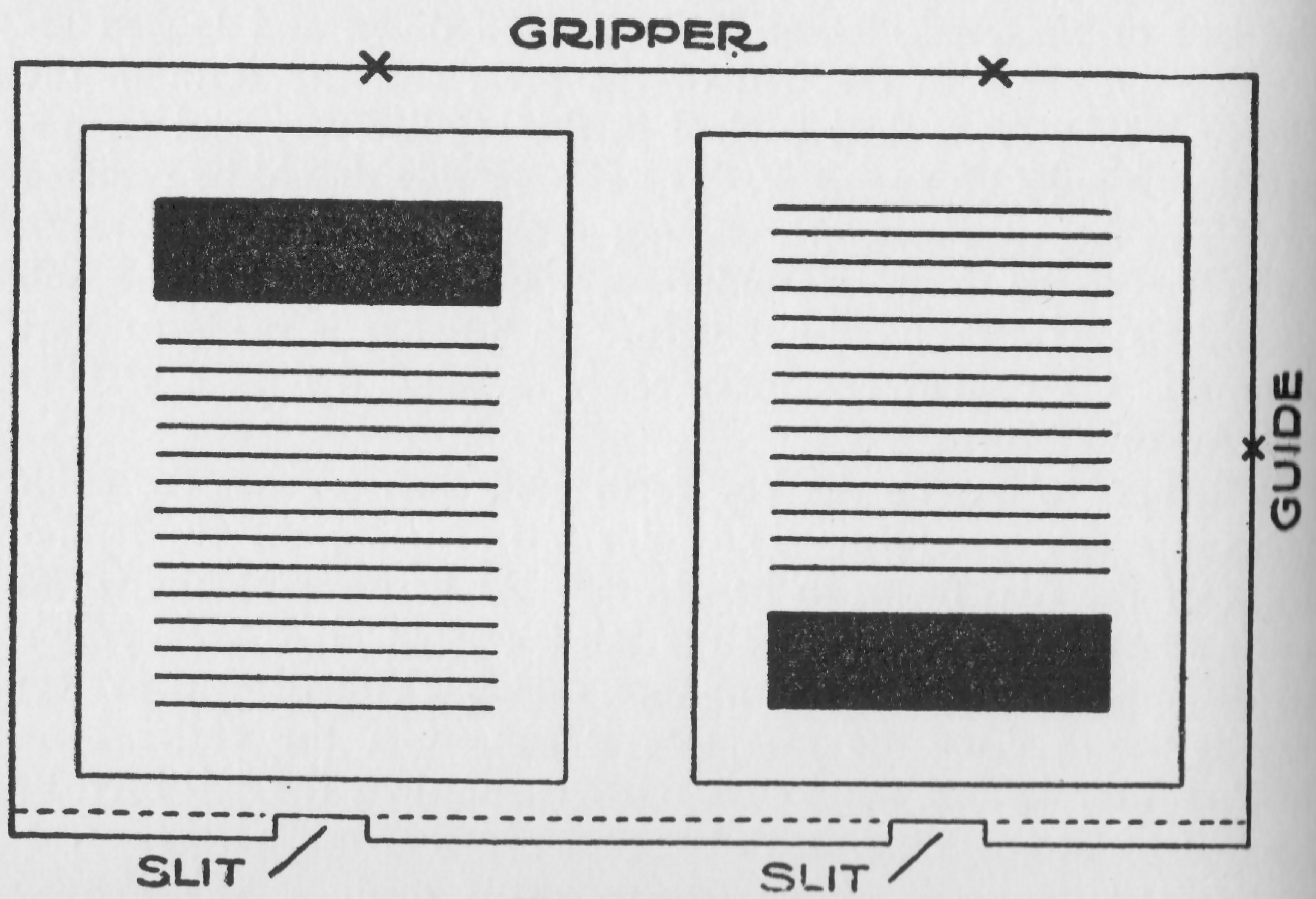


Illustration 10

The finished sheet of a work-and-twist form printed in two colors at one operation

To do the job in this manner means that there will be as many impressions on the job as there are copies in the order. The ten thousand copies mentioned for this job could be done with

ten thousand impressions for the two colors and finished copies could be had at any time in the run even if the plant had only one cylinder press to do the job.

The job may be run on a hand or mechanical fed press. When backing up just change over the side guide. Perfect register is possible in this method and press production is doubled because of two up instead of one up. (See illustration 10.)

Production is about the same as any job of similar quality. On regular weekly, bi-monthly or monthly jobs of this nature the economy of production warrants using this method. On single orders it is best to estimate the job both ways, single and split rollers, in order to ascertain if the quantity required will suffice for the spit roller operation. When the quantity on the order is large enough to offset the added time of preparation it is most economical to run the job by the split roller method.

Chapter XI

Setting the Rollers

Good rollers are among the most important of all the aids to printing of the better kind. Good rollers are the only ones that should be considered at any time. Those printers who do not have easy access to roller supply houses should carry extra supplies of rollers for emergency. Printers who have found themselves without a sufficient supply of usable rollers have ruined jobs because of the unfitness of the rollers they were compelled to use.

Rollers control the laying qualities of the ink as well as the uniformity in color. Ink and color have often condemned a job. Unsatisfactory color has been the basis of many a complaint. The most important operation of the press is the transfer of ink from the fountain to the form and then to the sheet. The success of this operation is controlled by the rollers. Fountains may be set perfectly, color may be uniform and matched to the "nth degree," but if the rollers are not of the right working quality the finished job may be ruined.

Rollers, in order to distribute properly must have the proper working efficiency, must be the proper size (circumference), must be free from flat spots and cracks, must fit the running condition of the type of work being printed, and above all must be properly set. Any or all of the other requirements may be met, but improper setting would disturb them all.

Covering capacity of the inking mechanism on all presses is vitally important to the printing proprietor. The ability to cover solid jobs with as few impressions as possible may help him to get the order. Printing quality can be greatly improved by the proper adjustment of the roller mechanism.

In order to have the rollers working properly they must have sufficient suction to take the dirt from the form so as to keep the type, halftones and solids clean. This suction or "life" as it is sometimes called, is represented by the tackiness in the roller.

All jobs and paper stocks accumulate a certain amount of dust and dirt during the running of the press. It is the duty of the rollers to keep the job as clean as possible. This can be done if

the rollers will assist in picking the dust and dirt off the form during the inking between the impressions. In "copying ink" work and "water color" work this tackiness is not desired because the water content ink which contains glycerine and the glycerine content "copying ink" tend to effect the rollers by swelling them. In this case it is necessary to kill the tack in rollers. If this precaution is not taken the rollers are very apt to become soft, melt or otherwise be ruined. Any substance, such as powder, that will soak up moisture, will overcome this tacky condition.

There are times when a "copying ink" job must be run on a press that does not have a set of old rollers in reserve for the purpose and it is then necessary to kill the tack. This can be done by rubbing talcum powder on rollers to take out the tackiness for the use of copying ink. After the tackiness is gone the rollers are wiped clean with a dry rag. This is mentioned here to show how printers a few years back provided simple methods to overcome their problems. To put tack in a lifeless roller use a cloth saturated with warm water or a very weak solution of lye.

The proper size of the roller refers to the circumference as well as the length. When the circumference is changed so, too, is the diameter. When the diameter is changed it means the roller is not traveling in the proper unison with the other rollers, form or bed of the press. In this condition the roller is apt to become heated through undue friction and melt.

Flat spots and lopsided conditions which may be caused by bent roller cores or perhaps from resting on some object can never be tolerated while running high grade work or heavy forms. No setting, regardless of the care taken with the operation can ever overcome this condition and such rollers should be discarded immediately. Bent cores should be straightened before new rollers are cast on them.

Hard surface rollers which contain cracks, however minute, cannot be used on good work. This condition will affect the covering qualities of any roller and will inevitably affect the color of the ink being run, especially if that color is of lighter shade than the previous one. The reason for this is that the dark color ink gets into the cracks and cannot be satisfactorily washed out. This will steadily discolor the light ink during the run. It is best to discard rollers of this type or if they cannot be dispensed with it is best to keep them for black work only. In this case it will also be found advisable to keep from using them

as the number one form roller in the press; that is, the last roller to leave the form.

Various styles of presses have different effects on rollers. Platen presses are rather hard on rollers because there generally is a slight slip between the form and the rollers while the rollers pass over the form for inking. Reciprocating type job automatic presses have a telling effect upon the rollers because of the sudden "jerk," "stop" and "resume," action required of the rollers with each movement of the bed motion in the inking mechanism. This condition also prevails on cylinder presses and for the same reason has the same telling effect on the rollers. Rotary presses are not quite as destructive upon the rollers. This is because the continuous revolving motion of the rollers, without the necessity of stopping and reversing is the most natural motion to eliminate the source of friction which causes most roller troubles. Regardless of the style press being operated, it is possible to eliminate most of the roller trouble caused through improper setting. This can be done by giving some attention to the minute detail of the roller setting operation while in progress.

Setting rollers is made easy when the proper implements are provided. It is unfair for any man to assume that his hit or miss judgment is perfect. Every man owes it to himself, his employer, and the press which he is operating, to see to it that the setting of the rollers is checked back by some foolproof method.

Tools and Methods

The implements required are the type-high gauge of outside dimensions; that is the type-high gauge must permit of making the test with the gauge measuring .918 of an inch and used like an inside caliper. If one of the gauges is not available it is possible to make one by using a seventy-two point bold face cap M or W and affixing a heavy wire to it. This may be done by drilling a hole through the body size or set size of the type and fitting the wire to the hole by either the snug fit solder or the drill and tap method. The other implement used in setting rollers is a homemade pressure tester. Two of these testers are necessary and they may be made from a sheet of sixty-pound super or M. F. book. These testers are made by taking two pieces of paper stock, size 8x10 inches. First fold them to size 5x8 with one fold. Then insert between these folded leaves a strip of paper stock size about 2x10 inches. This strip extends out of the ends of the folded leaves and slides freely. The idea is to insert these testers between the form and roller and the ink table and the

roller or the type-high gauge and the roller. Permit the strip 2x10 to extend out of the folded sheet far enough to get a hold on the strip to test the pull which represents the amount of pressure created by the roller resting on the form. Two testers are used on one roller, one at each end. All adjustments are made on both ends of the roller simultaneously. This is done to prevent the undoing of the proper setting which may be done at one end of the roller and undone when the other end is being set. When both ends are set at one time this difficulty is overcome.

For job presses or platen presses the testers should be placed between the rollers and the form and tested to ascertain the amount of squeeze being exerted on the roller. It is best to test one roller at a time because it is impossible to tell which roller is tightest if more than one roller is tested at a time. Expansion roller trucks help the adjustment of platen press rollers.

On job cylinder presses, that is, the automatics, the setting of rollers should be done before the form goes to press. This can be done by placing the form rollers into position and setting the rollers to the type-high gauge. Then set the form rollers against the distributor rollers, using the pressure testers, one on each end of the roller. Rollers should be set to a nicety allowing enough pressure to insure a gentle, yet firm contact. Additional distributors or angle rollers or fountain roller should be set by the same method.

Cylinder presses have the rollers set in the same method as explained for automatic job presses. It is absolutely necessary to have two sets of testers on cylinder presses because of the length of the rollers on these presses. It is best to have one man on each side of the press when this roller setting job is being performed. It is preferable to set the form rollers to the type-high gauge rather than to the ink table for there is a possibility the ink table may be out of true and yet this may not be noticeable under ordinary working conditions. Some men set their rollers according to the exclusion of daylight between the form and the rollers. This method is not as dependable as the method explained here.

On the rotary presses the pressure method is very effective. The curved plates make it impossible to use the type-high gauge made for flatbeds, but a similar gauge can be made for these presses by using a piece of electrotype for the gauge and fastening a wire to it the same way as explained for the flatbed type-

high gauge. The pressure method can be used to test all the rollers and the pressure being exerted on each. It is as important to know how much pressure is being exerted on the distributors and composition rollers as it is to know about the pressure between the form rollers and the form.

In order to insure good work with the minimum of waste time in running it is best to check up the rollers with every drastic atmospheric change. There is no telling as to what effect a change in the weather has made upon rollers being used and the change may occur overnight. Good results require good judgment in adjusting rollers. If this is done regularly the effect will be reflected in the quality of the finished product.

Roller Coverage on Cylinder Presses

There is a school of thought in the printing pressroom methods of operation which considers that the more form rollers in the press the better will be the roller coverage of the form. Another school of thought is of the opinion that if a perfect roller can be used one form roller will cover a form more uniformly when such a single form roller is properly set and properly fed from the other rollers in the press.

Color on a solid form run on a cylinder press will at times be lighter at the gripper edge than on the back edge of the sheet. If we use four form rollers for this job and supply a uniform film of ink to all the rollers we would have a uniform roller coverage of the form if we could keep a uniform flow of ink on the roller while applying the ink to the form.

The action of the press when the form is being inked is that the back edge of the form passes first under the form rollers. In the reverse motion the back edge of the form is re-inked toward the front edge of the form. The front or gripper edge of the form then is the last part of the form to leave the form rollers. Ink flows to the lowest point, hence, if there is more ink on the form rollers than on the form, the form rollers deposit the ink on the form. Adversely if there is more ink on the form than on the rollers the rollers will take the ink away from the form. It is for this reason that the gripper edge of the form is lighter than the back edge because at this particular operation the rollers have taken ink from the form.

If a uniform thickness of film of ink could be maintained on the rollers and the form, both times the form passes under the form rollers, uniformity of color would be maintained. When rollers start to ink the form with a film of ink that has become thin on the rollers after the form has been inked on the back motion so that there is less ink on the rollers than there is on the form, then the distribution of the remaining film of ink is changed. A perfect distribution permits form rollers to carry a uniformity of film for the entire cycle of the press.

The other school of thought believes that if an absolutely perfect roller can be found this roller should be the only source of supply to the form. In such case all other form rollers should be lifted off the form so as to not ink the form, but to supply the rider rollers and this one form roller with a uniform film of ink. This result would eliminate the difficulty of change of color on solid forms. Let us analyze this for a moment. If one form roller can be set perfectly to supply the film of ink to the form, and the three additional form rollers raised off the form together with the rider rollers will carry a uniform film of ink, then this one form roller should have supplied to it a more constant uniform film of ink for distribution over the entire form. This one form roller would ink the form on the first revolution. In re-inking it on the reverse revolution it would have a greater roller surface coverage, counting all the form rollers lifted off the form, than the roller form surface condition existing with four form rollers set on the form.

In one case four form rollers supply the ink to the form from the distributor, and the rider rollers and four form rollers remove the ink from the form when the supply of ink on the rollers is less than the amount of ink on the form. In the single form roller condition one form roller supplies the ink to the entire form and is in itself supplied from form rollers No. 2, No. 3, and No. 4, as well as the riders and distributors during the entire revolution of the press.

In any case the important point is that the film of ink fed to the rollers supplying the form should be as uniform as possible during the entire revolution of the press.

Chapter XII

Methods of Overcoming Offset

Offset on any letterpress printed job may be traced to any one of seven causes. The first may be the body of the ink used; the second may be the quantity of the ink required to maintain a desired color; third, the paper stock used may not be suited to other conditions on the job; fourth, overlapping of colors; fifth, excessive impression; sixth, rough handling of set sheets; and seventh, static electricity.

It is most important that the ink manufacturer be advised of the kind of paper stock to be used for the job. It is his duty to furnish the printer with an ink that is suited to the paper stock and which will give the desired printing result with the minimum quantity of ink. The working qualities of a printing ink are controlled by the body or vehicle in which it is ground. It will not be necessary to go into the scientific method of manufacturing printing ink. If this knowledge is desired it would be well to read some of the discussions written on this subject by well-known manufacturers of printing ink. We are most interested in analyzing the ink problem from the printer's point of view. For this reason we will discuss the methods of overcoming the difficulty of offset with the remedies that are within the reach of the printer through his pressroom facilities and personnel.

The body content of an ink should possess the characteristics required to keep the form clean, print the sheet with a smooth impression and film of ink, permit the sheets to rest lightly upon each other without smudge or offset and allow the ink to dry sufficiently to be handled in a maximum of twenty-four clock hours.

The body of ink should always be as stiff as possible for the best working conditions on the paper stock to be used for the job. Stiff ink is less apt to offset than is the soft ink, especially on hard surface paper. When soft and absorbent paper is being printed it is possible to increase or accelerate the setting qualities of the ink by reducing the ink with a liquid reducer.

These thinning reducers will tend to make the ink accept all the absorbing qualities offered by the paper. When ink is reduced

with a non-drying liquid such as kerosene great care must be exercised in its use. Dryer should be added to offset the non-drying qualities of kerosene or similar reducers.

A soft paper stock will permit a thin ink to penetrate the surface and soak into the body of the sheet. A thin ink that has been reduced with a reducer that has drying qualities, such as boiled linseed oil, will hold the color and body of the ink intact until it is dry. When a thin ink which has been reduced with a non-drying reducer is printed upon a hard surface stock the ink may set quickly and seem to be dry but may rub off like chalk. In this case the job may be ruined because of the smudging of the sheets in handling them while trying to give them another impression of "size" that would dry into the sheet carrying the color with it. Inks that chalk do not possess sufficient dryer to bind the pigment together with the vehicle with the result that the vehicle soaks into the sheet and leaves the pigment on top of the sheet and separate from the vehicle.

It is best to use a medium stiff or stiff bodied ink for hard surface papers. If the ink picks the surface of the stock it is best to soften the ink with a softer bodied ink of the same color. Offset on hard surface papers can be reduced to a minimum by strengthening the color of the ink and running less ink on the sheet. If this will not eliminate the offset, a small application of some of the various offset compounds may be added to the ink. Care must be used with these compounds as they are generally non-drying and may cause trouble. Beeswax, paraffin, and soap, all have a tendency to accelerate the setting qualities of an ink. It is somewhat difficult to incorporate the wax and paraffin into the ink because it must be mixed while heated. The soap may be used with greater satisfaction, but must be reduced to a liquid state before it can be incorporated in the ink.

Here are a few common and easily accessible reducing ingredients that soften the ink: Citronella oil, kerosene oil, lard oil, palm oil, castor oil, balsam copaiba, vaseline, liquid dryers, paste dryers and boiled linseed oil varnishes, Numbers 00000, 0000, 000, 00, 0, 1 and 2, raw linseed oil and boiled linseed oil.

Here are a few ingredients that will stiffen the ink: Paraffin wax, beeswax, magnesia powder, precipitated chalk, boiled linseed oil varnishes Numbers 5, 6, 7, 8, 9. Magnesia and chalk should not be used when printing halftone or Benday plates.

Here are a few ingredients that will give the ink a matt or flat finish: Vaseline, kerosene oil, magnesia powder, precipitated

chalk, laketine, lard oil, mutton tallow and the boiled linseed oil.

It must be remembered that the addition of any reducing ingredient that contains no color value changes the ratio of color to vehicle and thereby affects the depth of the color of the original ink.

Offset is often caused when the color requirement of some particular job calls for more ink than can be safely carried without offset. Engravers' proofs that have been tricked by double or triple rolling or wiping of the halftone with an oiled rag give rise to such a situation. Colored inks that have been double-rolled cannot be properly matched except by double rolling when on the press. This is often impossible (Kelly presses have automatic double roller features). As a substitute the ink is piled on the form and the sheet in the hope of matching the color with one thick film of ink in place of the two or three thin films of ink received in the double roll process. Fine coach varnish work always received as many as twelve coats of varnish, each of which was allowed to dry, then rubbed down with rotten stone, after which the next coat of varnish would be applied. No coach job was ever completed with one thick coat of varnish to take the place of the twelve thin coats. So, too, is it impossible to get the same color result with one thick film of ink as compared with three thin films as received in a triple-rolled proof. It can't be done!

It is sometimes necessary to give a job a double impression in order to get a desired result. The two thin films of ink will work better and smoother than the one heavy film and will not be as apt to offset. The economy of giving a form two impressions without slip-sheets, as compared with one impression and slip-sheets, tends to reduce the cost of production, if the form is one that can be run faster when not being slip-sheeted. The smoother finished job of two impressions requires greater care in running because of the intricate register demanded by the two impressions. When the nature of the job does not warrant a double impression because of demands of register it may be more economical to slip-sheet or double roll the job.

Hard Surface Stock

Finish of stock sometimes makes demands on the other factors in the job in order to eliminate offset. Hard surface stocks, as previously explained, demand a minimum color and utmost setting and drying facilities in order to overcome offsetting. An

ink that can penetrate the surface will stick to the sheet and not rub off. An ink that will not penetrate the surface must dry by oxidation in order to hold the color and paper stock together. Printing of this nature could be compared to painting on glass. The paint cannot be touched while in the process of drying, neither can the paper stock be handled roughly lest it will offset. Ink of this nature should be matched to the sheet on which it is to print. This precaution must be taken in order to get satisfactory results.

Rough handling of wet sheets could rightfully be termed the greatest cause of offset. A test for offset demands that the pressman lift one corner of the sheet to see if the job is offsetting. When he lifts the sheets there may not be any offset on the job and the moment he drops the corner of the sheet back on the pile he may create the offset which he was looking for when he lifted the corner of the sheet. Pile deliveries are playing an important part in the elimination of offset. Under normal conditions a pressman can tell from looking at the printed side of the wet sheet whether the quantity of ink is in excess of the amount necessary to print the job without offset. Of course, when a color is to be matched the pressman has no choice in the matter, but must supply the amount of ink necessary to maintain the color regardless of the proper amount required to print the form and stock properly, to strengthen the color of the ink, lessens the danger of offset.

Excessive impression is sometimes responsible for offset because the back side of the indented sheet acts like a comb going across the wet side of the sheet underneath it and the points of the indention accumulate the wet ink and by so doing cause the sheet to offset. It is best to use hard tympan or packing when this condition is encountered because the hard packing will help to prevent the occurrence of indentations in the printed sheet.

Overlapping or super-imposition of color also creates a condition that tends to make a job offset. Overlapping is a great offender because the absorbing quality of the paper is reduced at the spots where the colors overlap. If a certain color is desired the amount of ink necessary to maintain that color may suit the paper stock but would be too great for the part of the job where the colors overlap. In this case the spot where the colors overlap would not absorb the ink and would cause the excess ink to offset against the sheet above it. In cases of this kind the amount of ink required to print the job must be determined by the require-

ments set up by the overlapping sections of the job and the ink made to conform with these conditions.

Static Electricity

Static electricity is a demon that evades control especially on cold days. Everything on the job may be perfect—color, impression, stock, quantity of ink, and yet static electricity will cause the job to offset. Static is very difficult to control. Neutralizers (gas or electric) and humidifiers are sometimes effective in overcoming the static but all pressrooms are not equipped with neutralizers as yet. No doubt they eventually will be.

Crude carbolic is the best "poor man's" neutralizer yet discovered. It can be purchased at the corner drug store for a few cents. One application on the top sheet of the packing is sufficient to overcome the static electricity for from one to three thousand impressions. The crude carbolic kills the static and allows the sheet to lie free from the effects of static. Wet ink on freshly printed sheets has a better chance to set when the sheet is free from static. There are no harmful effects from the use of crude carbolic and it works exactly the same as oiling off the packing.

A box made for the delivery end of the press will help to eliminate offset if the sides of the box are closely fitted to the sheet. In this way the sheet will rest on the air between itself and the previously printed sheet because the box will keep the air confined within it. The air between the sheets retards the action of the sheet in falling to the pile. In retarding the action of the sheet the time allowance for the setting of the ink is increased. The additional time allowance gives the ink a better chance to set before it touches the preceding sheet.

Spray guns, paraffin and other non-offset liquids are being used with considerable success on single and multi-color presses today. The pressman must use great care in applying these small globules of sprayed liquid to the sheet. The quantity applied to the sheet must permit of protecting the ink (by accelerating the setting) from being smudged by the sheet on top and at the same time not interfere with the sheet in general.

There are times when a work-and-turn job must be backed up before the ink is sufficiently dry to stand the pressure applied by the impression. These jobs may seem dry enough to back up because the ink seems to be set and dry but the impression will pile and cake the ink on the top sheet of the packing and cause the printed side to smudge. A simple method to overcome this condi-

tion is to substitute a sheet of newsprint stock for the manila top sheet. In fact, it is best to put the news sheet in the clamps and then wind it around the reel with the manila top sheet. Then soak the news sheet with machine oil, the excessive oil on the news top sheet is removed by running waste sheets through the press, and the job is good for from one to two thousand impressions without the difficulty of smudge. The condition of the ink will naturally control the number of impressions obtainable from the news sheet.

Shifting tympans on web-presses are being replaced by stationary carborundum top sheets which have the ability to run for many hours before it becomes necessary to wash them off. These carborundum top sheets stand up under runs of 100M or more and many printing plants operating web or perfecting presses are taking advantage of this new and economical method of increasing production and quality while eliminating the shifting tympan.

The most modern method of setting ink quickly is the installation of a spray gun and a gas burner between the delivery end of the press and the jogger.

Some non-offset sprays operate with a starchy fluid fed into a spray nozzle and atomized with air pressure into a spray. Width of spray is adjusted at the gun head. The basic principle is that when properly atomized, the water and alcohol in the fluid evaporate and the solids or dry globular particles drop on printed surface and form the separation necessary to prevent offsetting.

The four adjustments to obtain proper sized particles, are, height of gun, amount of fluid, amount of air and size and shape of spray. Minimum distance of gun from sheet is 12 inches. The height should be equal to largest dimension of sheet. Distance of gun from sheet depends upon size of sheet and nature of job.

Necessary air pressure varies from 10 to 50 pounds according to equipment. Turn down adjusting screw for a small circular spray. Turn up adjusting screw for a fan-shaped spray.

Large particles are produced with less air and more fluid, smaller particles by using more air and less fluid. Use light fluids to produce small particles for coated papers and heavy fluids to produce large particles for rough surface stocks, box covers, cardboard, high gloss inks, overprint varnishes, metallic inks, cellophane, celluloid, and glassine, etc. Deliver particles dry. Test by spraying atomized fluid on back of hand, palm resting on delivery pile. If atomized particles are damp to the hand, use more air, less mix, or raise gun higher, or carry a wider spray to spread particles over larger area.

Dry sprays are a recent development.

Chapter XIII

Work-ups, Cause and Remedy

One of the greatest benefits to the printing industry was the perfection of the electrotype plate. A considerable percentage of printers' returns has found its way into the red column because of spoilages through spaces working up. The electrotype has done much to eliminate this condition in the last few decades. Most printers will not let their foundry type go to press but prefer to plate the job. Advertising typographers insist upon this practice.

By electrotyping all foundry type and thus preserving it in perfect condition the printer will provide his customer a better quality product and insure himself against the lost time in changing bad and worn letters when the job is on the press ready to run. The cost of the electrotypes is charged to the job direct.

One of the bad features about work-ups is that they cannot be seen until they are printed. If they are not quickly detected it means lost time on somebody's part to eradicate them by scratching or the spoilage from throwing the sheets into the "bag."

Monotype and foundry type are affected most by the conditions in the form. If the furniture between the pages is askew the lines cannot be properly adjusted and the spaces between the words ride to the tightest part of the line, which is the top. If the type is not in perfect alignment, being larger at top than at the bottom the same condition will prevail. (See illustration 11.)

Illustration 11

Spaces work-up to the top and print along with the type

When a line is tighter at the top than it is at the bottom the space will move toward the top with each impression of the form. The only reason that the spaces do not work themselves entirely

out of the form is because the impression on the packing cylinder holds them in place with the other lines of type as each impression is being made. Forms made up so that they print the lines of type running around the cylinder show the greatest tendency to create work-up difficulties. This is because each piece of type in a springy form will rub against the spaces and the result is—work-ups. Low spaces have certainly helped the printer because the space must work-up a great distance in order to print. But then these low spaces are a detriment to the electrotyper because they hinder his work in lifting the moulded case from the form of type.

Slugs should be locked up to print the line around the cylinder. Type should be locked up to print the line across the cylinder. Stop long enough to study the problems as to why the spaces work-up. Eliminate the result by eliminating the cause. The simplest way of doing things is the most successful.

Work-up Remedies Suggested

When casting type check it for any differences in size between the top and bottom of the body setwise and bodywise. The first thing to do when the work-ups are encountered after the type is in the form and running is to insert short cards or leads at the bottom of the type pages between the type and the furniture. This remedy is an old one and is successful because it makes the type pages tighter at the bottom than they are at the top. It is best to use blotting paper of the heavy-weight variety, cut in strips about a quarter of an inch wide and long enough to extend the full measure of the page. The pliable nature of this stock will allow for the discrepancy in the justification of the individual lines by adjusting the loose lines to the tight lines. When the difficulty is found to be in the furniture, short one-point or two-point leads should be used to overcome the spring by being dropped between the offending piece of furniture. It is always best to change the furniture if time or material permits.

If the difficulty is not overcome by inserting these short cards and leads it becomes necessary to apply another preventive. In seeking a way out of his trouble the printer applies all sorts of ideas in the hope that he will find one which will permit him to run off the job with a minimum of lost time due to pushing down the spaces. One of these remedies has been an attempt to glue down the form to a heavy manila sheet with the hope that the spaces would adhere to the sheet and not work-up. This is preposterous,

of course, when we consider the tremendous pressure being exerted by the impression each time it goes over a springy form. This pressure is transferred to the type and spaces in the form because they are rubbing against each other and thereby changing the position of each other until the spaces are even with the type and printing with them.

It is possible to keep these spaces from coming up to the top and printing by the same principle that we apply to an automobile when we place a stone behind the rear wheel to keep it from rolling away. If we place an obstruction in the path of the space which is traveling up against the side wall of the type we can keep the space from coming to the top and printing with the type. This obstruction must be applied in liquid form and allowed to dry, when it becomes sufficiently hard to stop the space from working up to the top. (See illustration 12.)

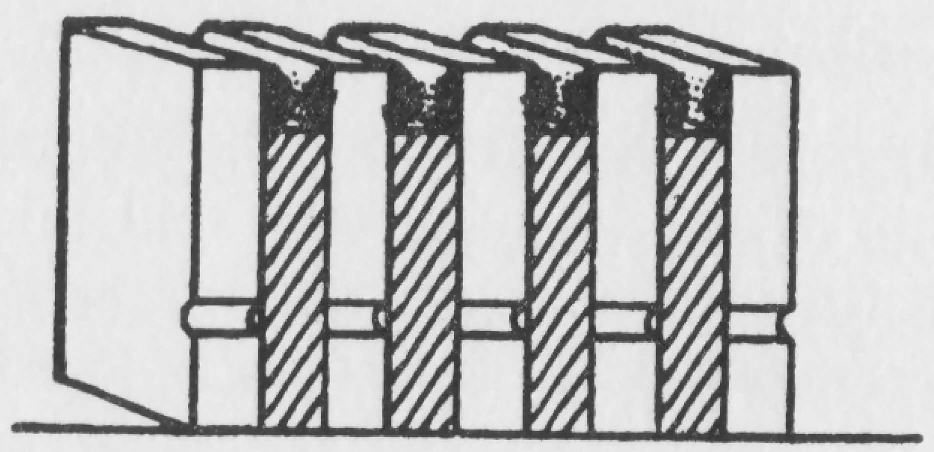


Illustration 12

Dry shellac which adheres to the body of the type will obstruct the progress of a work-up and hold it in place below printing surface of the form

A case history recounts that a 64-page form of monotype gave considerable trouble with work-ups. This form was on a two-color Miehle Press. After trying to overcome the difficulty with the usual remedies, which did not relieve the situation entirely, it was decided to use the following shellac method.

The Shellac Method

The necessary equipment is two clean form brushes, one quart of orange shellac, one quart of denatured alcohol, and some clean rags. The application of the orange shellac is made as follows:

1. The form is scrubbed absolutely clean with an ordinary form brush and allowed to dry. All spaces are pushed down.
2. The first new form brush, which is always kept clean and used for shellac only, is flooded with shellac and brushed over the entire form. A clean rag is kept handy and soaked with alcohol. The shellac runs down the sides of the type. The shellac on the face of the type is quickly washed off with the clean rag until all the shellac is cleaned from the type. Great care should be exercised in keeping the alcohol from coming in contact with the shellac on the sides of the type because the alcohol will dissolve the shellac and cause it to lose its effectiveness for this purpose.

3. The second clean form brush, damped with alcohol, is then used to scrub out the type before the shellac has a chance to become hard.
4. The form is left standing for about 15 minutes to allow the shellac to dry after which the run is resumed. No further difficulty from work-ups should be encountered.

It is always good policy to apply this shellac preventive as soon as work-ups are encountered. The constant pushing down of work-up spaces means curtailed production, loss of profit, and impaired quality of work. It also means scratching of work-ups and ruining of type by driving down the spaces. In driving down these spaces the type is widened, which makes the top tighter and susceptible to more work-ups as the job progresses.

Evidence as to the effectiveness of this application of shellac is given when the whole page sticks together at breakup time. Some pages adhere to one another so tightly that they can be lifted at one corner with two fingers and yet not pi. Because of this difficulty in breaking up and distributing the type it becomes necessary to keep denatured alcohol on hand to clean the type. If there is no foundry type in the form, of course, the whole page goes in the hell box.

Slugs Will Show Wear

Work-ups with forms containing linotype slugs will show the result of any poor justification in worn type. When light face types are used it may occasionally be necessary to change a slug that shows wear due to a springy form. It does not take many impressions on slugs to thicken the face. Proof of this is brought to mind by the loss of uniformity in the type faces on a job of slugs that has been run for a few thousand impressions and then is corrected for a reprint. The new slugs look like a different family of type.

When trouble of this nature, springiness and work-ups, is encountered in a form of slug matter the reason for it is similar to that of the monotype or foundry type forms. The top of the

form is tighter than the bottom. If possible the slugs should be tested and corrected for future jobs. The insertion of short cards or leads between the type and furniture is the remedy. Use furniture of the largest possible dimensions in the lock-up. This will eliminate some of the difficulty caused when many pieces of smaller furniture are used in the lockup.

We have seen forms on cylinder presses that permitted the entire chase to work-up. In cases of this kind it is best to turn the chase over in order to get the tight side down. This turning of the chase does not always overcome the difficulty of work-ups in the form but it does help the difficulty with the chase. When the work-ups in these forms are treated with the short cards or leads, they generally respond to the treatment and stay down.

Sometimes the cross bars in the chase will work-up. When the slot ends of the chase bars are graduated away from the top side of the chase the cross bars cannot work beyond the play room in each end. When the cross bars are not graduated on the ends that fit into the chase there is no limit to the distance they may work-up. In this case it is best to unlock the chase and turn it upside down in order to get the tight side down.

Use of Brads

Very often we find it necessary to use wire brads in order to hold down metal furniture that has been used in the make-up of the form. This is done by nailing the brads across the top of the small piece of metal furniture and into the wood base of the electrotype plates used in the forms. It is best to remedy the condition by inserting the short cards or leads, but if it is a register job and all in register and running when the defect is found it requires a lot of self-persuasion to unlock the form and insert the short leads, re-register the form and proceed. For this reason the easiest way via the wire brad route is mostly used on short run register jobs but the wise pressman will use the proper method, consisting of short leads, to overcome the difficulty.

Chapter XIV

Remedy for Presswork Wrinkles

Many print shop proprietors suffer serious set-backs in pressroom production because wrinkles develop in the sheet after the job has been O.K.'d. In most cases it is not detected until the job has started to run. The trouble is so serious at times that it becomes necessary to take the form off the press and run it half size in order to control the wrinkles.

The condition causing this difficulty can be detected before the form goes to press. All factors should be considered even before the material is purchased. It is possible to eliminate the wrinkles without the change over of form. Analyze the problem. Separate each minute possibility of cause.

Springy Form

A springy form will create greater impression on the sheet, while being printed. This is due to several causes: warped blocks, warped furniture, or chases that do not align at a perfect 90 degree angle with the bed of the press when locked therein. The combination cut and type form should be locked on the bed of the press in the proper manner. All quoins in the chase should be loosened, the chase should be firmly clamped to the bed with the bed-clamps and the form should be locked in the chase by tightening the loosened quoins. Each step of this operation should be checked for "spring" and if detected this should be eliminated before proceeding.

Increased impression on springy forms is caused by each impression of the press. The printed matter or type and cuts rub against the unaligned furniture or chase. When this happens the type and cuts go to the tightest part of the form which, in springy forms, is the top, and force themselves up against the sheet with greater force as the form springs toward the sheet being printed.

A remedy for springy forms is short leads or cards placed along the bottom half of the cuts between the irregular parts of the form. This will bring the tightest part of the form to the bottom and thus eliminate the spring.

A short lead dropped between the irregular electros will cause the cuts to align with the bed of the press and eliminate the spring

though it sometimes becomes necessary to reblock mounted electros in order to secure best results. Wrinkles caused by this condition should disappear when the cause is corrected and proper impression maintained throughout the job. (See illustration 13.)

Illustration 13

To fix a springy form, make it lock up tight at the base by placing short reglets or cards between cuts or type

Plate Height

When the entire form is over .918 of an inch or below this measurement the cylinder circumference represented by the top sheet is traveling either faster or slower than the form with the result that the difference in travel will be reflected in the packing which will pull out or creep up as the case may be. This condition may cause a thin sheet of stock to wrinkle when going over the impression because of the slip occurring while the impression is being printed. All plates, whether mounted on wood or patent base, should be checked up to ascertain whether they are the proper height to run. A check-up of this kind will save both time and money if done before the form reaches the press. Pre-makeready considers the correction of plates and type to be printed on a corrected press. Economies through pre-make-ready are being seriously considered by successful printers. All efficient printers correct form imperfections before going to press.

Soft Packing

Quick make-ready via the soft packing route often causes wrinkles. Jobs of solid or semi-solid variety when printed on a soft paper can be made ready much faster with a soft packing but if the grain of stock or condition of stock is such to encourage wrinkles the soft packing will accelerate the coming of the wrinkles. It is next to impossible to get rid of a wrinkle of this kind without first changing to a hard packing. Use all manilas with sufficient S. & S.C. book for the overlays and makeready. Change the packing and reduce the impression to a "kiss." This will require additional make-ready because of the excessive impression used with the soft packing. If this change does not eliminate

the wrinkle trim down the packing under the top sheet to about two leads from the printing edge of the form. This close trimming should be done both ways, across and around the cylinder. This will reduce the stretched paper edges which are larger than the inside of the sheet and which fold up into a wrinkle because the paper stock has no way to get out of the impression with the fold. Further explanation of this condition is given under the following paragraphs.

Grain Most Important

One of the first things to check for prevention of wrinkles is the way of the grain of stock. Invariably the cause of a wrinkle in a border or other kind of printed job is the fact that the grain of the stock runs around the cylinder instead of across the cylinder. Paper stretches more across the grain than it does with the grain. Because paper stretches more across the grain it should be obvious that a border form will create less trouble if the stock will adjust itself to the impression as the sheet is being printed. We have seen many jobs saved from the "bag" by turning the form around to print the sheet the grain across the cylinder when the way of the grain of the stock was overlooked at the time of purchase. A good test to tell if the grain of stock is causing the trouble is to pull some sheets with the grain running across instead of around the cylinder. It is assumed that everyone knows that the clean tear of the stock means the way of the grain and the irregular tear means against the grain. A good method of telling the way of the grain with only a small piece of stock available, say four inches square, is to wet one surface the entire

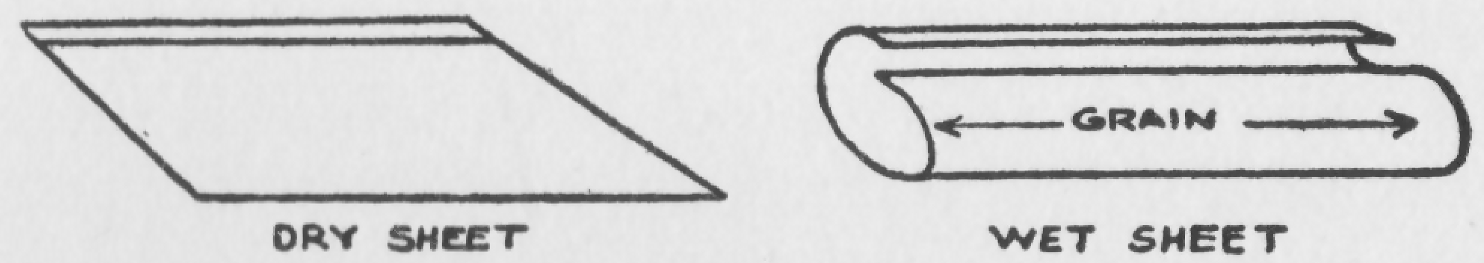


Illustration 14

Showing how one wet surface of the sheet will curl across the grain

piece which will immediately curl against the grain. Thus the rolled up piece represents the way of the grain by the length of the roll. (See illustration 14.)

Atmospheric conditions change the size of paper stock according to the relative humidity in the room at the time the sheet is

exposed to the air. Three minutes after a sheet is exposed to the air it has consumed 85% of the moisture that it is able to hold. This means that a press running 900 impressions per hour or 15 sheets per minute requires 4 seconds per sheet and this sheet so exposed is absorbing 25% of the moisture that it can possibly carry while in the course of going through the press.

Stock Stretching

If the relative humidity in the room where the sheet is exposed is higher than the moisture contained in the paper stock the sheet will stretch. If it is lower, the sheet will shrink because it will dry out. Manufactured weather which controls the humidity in the pressroom naturally will tend to eliminate this condition but all pressrooms as yet are not so equipped, hence this discussion about the changing of paper stock sizes.

The change in the size of paper stock should be plainly evident. Paper stock contains minute fibres of cellulose, rosin sizing or glue for the uncoateds and china clay coating added for the coateds. When it absorbs moisture it swells. The minute fibres in the paper absorb the moisture from the air. These cellulose fibres become thicker and longer. The swelling is greater across the fibres. The natural action of these cellulose fibres when put on the paper-making machine in the form of pulp is such as to cause them to lie alongside each other as they flow through the machine lengthwise. This action is similar to that of two tree trunks floating down a fast moving river. The wire on which the paper is formed is given continuous jerks sidewise in order to change this natural position of the fibres. Some fibres are affected by this screen action and swing crosswise. These tend to strengthen the sheet.

When a pile of paper is exposed to an abnormal moisture content atmosphere, the edges of the sheet swell and the center of the sheets not so exposed do not swell accordingly and the result is wavy edges. The edges are longer than the center of the sheet. Some sheets size 38x50 have been known to stretch 3/16 of an inch across the grain and ¼ of an inch with the grain.

If a border were to be printed on a sheet of this size and wavy edge condition the 3/16 and ¼ inch stretches would have to wrinkle their way out of the impression in order to get through the press. Conditions of this kind demand the assistance of card-board strips which are pasted on the top sheet as close to the printing edge as permitted and are extended along the sides of the top

sheet around the cylinder. It sometimes becomes necessary to paste three pieces of heavy-weight blotting (which adheres more readily than newsboard) on top of each other in order to take up the paper in the stretched and wavy edges. In case more than one such strip is needed it becomes necessary to paste the strips on top of each other extending from about one inch beyond the back edge of impression up to about the center of the border or printed form. The strips must be graduated up to the last strip which must be highest at the back edge of the sheet. (See illustration 15.)

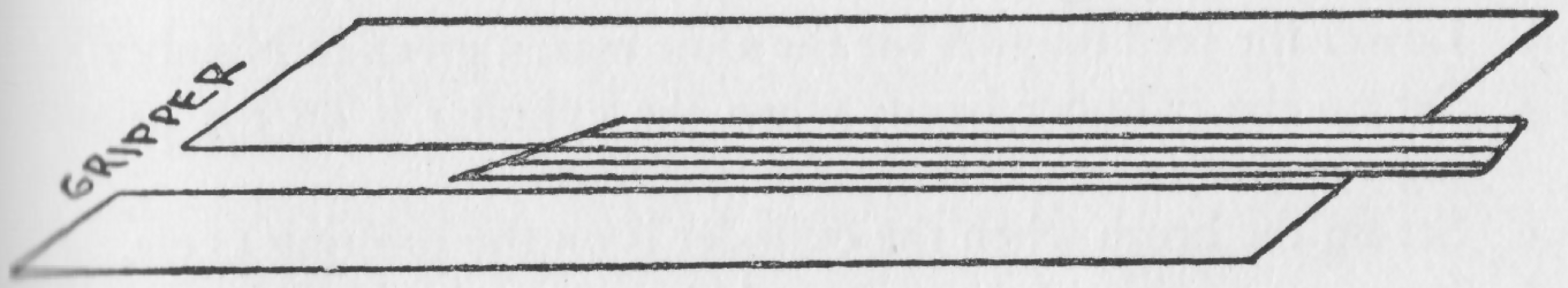


Illustration 15

Showing how the card-board strips are pasted on the back end of the top sheet

There are times when a strip may be advantageously pasted on the cylinder in front or back of the border being printed. In cases like this the front and back strips are substituted for the side strips as both kinds together do not always work satisfactorily.

Sometimes a wrinkle runs into a job because there is an air pocket between the sheet being printed and the top sheet on the press. If this is the case, strips of the same nature as previously explained can be used with considerable satisfaction. But when a wrinkle of this kind forms don't forget that the air is between the sheet being printed and the top sheet on the press and being here, must be handled accordingly. We have seen some pressmen drill holes in electrotype blocks in order to let the air escape but this does not help the situation because the air is not between the sheet being printed and the form but underneath the sheet and between the printed sheet and press top sheet.

One case history is of a letterhead job which contained a two-point rule border and was run four up on an antiquated pony cylinder. The wrinkle was caused by the lack of necessary equipment on the press—the brush being omitted. The grain ran across the cylinder, but an air pocket caused a wrinkle in the back edge of the sheet. The production on this press had been nil for a day

and a half. The pressman sought aid and when the strips of card were pasted on the top sheet, and an apron put on the press to take the place of a brush, the wrinkle disappeared entirely and the job proceeded without further trouble.

Additional Methods to Eliminate Wrinkles

Some devices for keeping the air pockets from collecting under the sheet are as follows:

1. Relieve the impression as much as possible.
2. On a cylinder press lower the feed-board—this will deliver the sheet to the cylinder in a lower position.
3. Lower the feed tongues for the same reason given in Number 2.
4. Set up the cylinder bands when the cylinder is on the printing cycle.
5. Set up the brush when the cylinder is on the printing cycle.
6. Insert an apron of heavy stock between the bands and the cylinder. Extend this to about one inch from the point of printing then trim off enough to clear form on return motion.
7. Place flat tapes around the cylinder in the margins and place rubber band at the end of the tape under the feed-board.
8. Trim the packing under the top sheet as close to the make-ready as possible. This allows the sheet to spread out while being printed.
9. Remember what was done to relieve the condition in this instance and apply the same method to your next problem.

Chapter xv

Slurs, Their Cause and Remedy

Slurs may be found on all types of presses. The reason for the slur may change in accordance with the kind of press being operated but there are many sources of slurs that are similar on all types of presses. A slur is very apt to turn into a "wear" if not caught and eliminated in time to prevent the usual effect, that is, a burnishing result on plates or type.

We shall consider the cause of slurs on all three types of letter presses—platen, cylinder and rotary. As previously noted there are some slurs caused by the same condition on all three types of presses. In order to cover the reason and remedy for each we shall cover all kinds of slurs on all presses. It must be remembered that circumstances alter cases. The origin of many slurs could rightly be attributed to faulty mechanical conditions of the press although this is not always the case. It is therefore assumed that the presses mentioned herein are in good mechanical working condition.

A slur or drag is caused by a slip. Something is moving either before, during or after the impression is taken. This slip or drag may make a halftone plate printed on a platen press look as though it has double the number of dots in it, or the dots will be double the size and lop-sided. This is due to the sheet getting two impressions instead of one. This double impression may come from any condition that would permit a "kiss" impression on the sheet being applied directly before it is printed. A loose packing, a loose plate, a slipping gripper or several other reasons might be responsible.

Air Pockets

Platen presses are the most frequently afflicted with this difficulty. Air pockets created in the sheet during the impression may cause a slur. This type of slur will show that the sheet is touching the inked form either before or after the impression has been taken or possibly both before and after. The air pocket that is formed on any press while the sheet is being printed always forms between the sheet being printed and the top sheet on the press.

This air cannot work out from under the sheet gradually as it should and therefore causes the sheet to rub against the inked form and take the ink with it. It is this ink that really represents the slur. Remedies for this type of slur would include changing the tympan to one of hard variety which would contain only pressboards and manilas. A frisket to which could be attached a number of corks would also help overcome the trouble.

Uneven Platens

An uneven platen will cause a slur on a full form job although it may not cause any trouble on small forms. The best remedy for this condition is to even up the platen. This may be done by placing a forty-eight point cap "M" in each of the four corners of the chase, dress the bed of the press with the desired amount of packing, which should provide sufficient working sheets for the work being done and allow at least one pressboard for protecting the make-ready. It is permissible to allow enough pressboards to allow printing cardboard on the press without the necessity of adjusting the bed of the press to accommodate the thickness of the cardboard. A bulky packing always causes trouble and it is advisable to eliminate this unsatisfactory condition at all times. After the impression screws have been adjusted to permit each cap "M" to print with equal impression and sharpness, the bed of the press should be kept in this position at all times.

Grippers on a platen press are often the cause of a slur. This happens when the grippers are set unevenly, thereby effecting the distribution of a uniform tension over both ends of the sheet. Under such a condition it will be noticed that one gripper is touching the sheet a little ahead of the other gripper. This slight difference in pressure against the sheet may cause it to move slightly, thus making it rub against the form and cause a slur.

Packing

Loose and baggy packing is the most frequent cause of slurring on platen presses. The looseness or bagginess may be caused by uneven pressboards or other packing. This bulged condition causes the sheet to strike the form before the impression is taken, thereby showing a slur. The remedy for this trouble is to remove the bulgy packing and substitute a flat packing for it, also tighten the bales to remove any play.

Too much packing is also bad as it causes the sheet to be above the impressional level which means that the sheet is above the printing level and is being printed before the press is in the proper

position for pulling the impression. The best way to overcome this is to repack the bed of the press and reset the impression screws as previously explained. It is well to test all the material in the form before any decision is made in this regard.

Soft packing is another common cause for slurs on job presses. A hard or semi-hard combination is best at all times. Soft packings save some make-ready time but lose time when the job gets running. A soft packing will fall away and require constant attention. Pressboards should always be run up top next to the top sheet. This makes for a hard packing but does not overcome a soft foundation if sheets below the pressboard are of soft variety.

Roller Troubles

Rollers also cause a slur, but it is of a different kind from that caused by the other agencies. Roller slurs are caused by improper depositing of ink upon the form. These roller slurs may be detected by close study of the impression. The ink will be seen to be in overabundance in some places and lacking in other places. This trouble is also caused by something slipping while the ink is being applied to the form. The rollers may be too hard, or too soft, or lop-sided and uneven from the center of the roller stock to the edge of the roller. The gideons, too, may not be the same size as the roller, in which case the roller will be riding the form instead of the tracks and in so doing may be jumping over the edge of the form and causing the slur.

Lifeless rollers—those which do not possess stickiness—are also apt to slide over the form and cause a wipe which will look like a slur in the impression. In order to overcome these conditions one must overcome the faults in the rollers. It is possible to give a new life to old rollers by washing them with warm water, but the revivified roller is not always satisfactory and it is suggested that a new set of rollers be used to improve conditions.

Mechanical Defects

A slur on a platen can generally be overcome with some perseverance by the use of a frisket and some corks attached to the frisket. In the case of mechanical defects it is always wise to send for a machinist, as he is best able to tell if important gears and cams need repair. It is useless to attempt to overcome a mechanical defect in a press on the basis of ideas gleaned from one's own experience because at best it will be an experiment—and experiments are more costly than repairs. It is dangerous, too, to run a press that is not perfect in every detail, especially with respect to

register. There is no telling just when a job may need to be imprinted because of a broken letter or plate. This imprinting can not be done satisfactorily unless the press registers at all times.

Slurs On Cylinder Presses

On cylinder presses—and this includes the small automatic jobbers that use the cylinder method of printing and delivering the printed sheet—the causes of slurs are manifold when we take into consideration the possible mechanical defects that might be responsible for slurs. Therefore we shall not try to cover the causes of slurs due to mechanical defects in the press. We shall cover the causes and remedies of slurs occasioned by the material we have to work with, proper adjustments to accommodate the stock form, or press requirements of the job in question.

Some of the sources of slurs on the cylinder type press might be enumerated as follows: Springy material in the form; belly in the sheet caused by the grippers and tongues; sheet slipping as it is going around the cylinder; register rack out of adjustment; form above or below type-high; air pockets in the sheet which may be caused by the form or green and unseasoned stock; bearers which are not of correct height; plungers which are out of adjustment; too much or too little packing on the cylinder; rollers slipping or out of proper alignment with stocks and the outer surface of the roller; loose packing; soft packing; bands out of adjustment; brush out of adjustment; a job which requires an apron; loose plate in the form, or uneven plate in the form which in this sense means an uneven plate which is springy. And, of course, to this must be added all the possible combinations or causes due to mechanical defects in the press.

It is assumed that the pressman can make such minor press adjustments as are required to set a register rack. It is not assumed that a pressman possesses the ability to crawl under a cylinder press and adjust a gate or pack a shoe in order to get the press into working condition as regards to register and slurs. Yet there are some pressmen who can do this highly mechanical operation.

Springy Forms

Let us not forget that slurs occur because there is something slipping in the form or on the press. The slip may be either sideways or up and down. One of the causes for the up and down slip is springy material in the form. Springy material in the form will permit the form to touch the sheet before the sheet and form meet at the printing cycle contacting point. When this happens

the sheet is really getting two impressions, as previously mentioned. Springy material in the form may be made flat and secure by inserting short leads in the form between the furniture and the plates in question. (See chapter on Work-ups.) It is necessary at times to have plates reblocked to overcome this springiness.

Sheets "Bellying"

Some slurs are caused by the grippers creating a belly in the sheet. The belly holds the sheet in a position off the packing where the sheet is rubbed against the form before the press goes into the printing cycle. This means that the tongues on the feed-board are set too high, thereby causing a bellied condition in the sheet which is held there by the grippers. The proper height for the tongues and feed-board is a sufficient clearance for about two five-point manilas—in fact all register work should be set this way. The grippers should be slowed up until they nick the sheet then set ahead only sufficiently to cause the elimination of the nick, this should be set while the press is running. If feed-board and grippers are kept timed in this way there should never be any slurs or bellies in the sheet at the gripper edge.

Slurs caused by the sheet slipping while going around the cylinder really permit the sheet to slur by dropping to the form before the form is ready to print the sheet. This can be avoided by setting up the bands and brush and inserting an apron around the cylinder if necessary.

Register Rack Adjustments

Improper adjustment of the register rack will permit the cylinder to slip into a driving position after the cylinder has left the register rack. Assuming that the press is riding the bearers properly and that the bearers are the proper height, the register rack can be adjusted by putting the press in the printing cycle and stopping it just as the cylinder comes into contact with the register rack; then open the bolts that hold the rack and move the rack ahead until the front teeth on the register rack touch the back of the teeth on the cylinder; then tighten the bolts and run the press a few times to check the position of the rack. This may be done by spreading a thin film of ink on the front of the teeth on the rack. It must be remembered that register racks on old cylinder presses are generally worn out at the front teeth. This requires setting of the rack at the place where the teeth are not worn. Standard gears always have three teeth in contact at one time. One tooth is in mesh, one tooth is coming in mesh and the third

tooth is going out. Sometimes a register rack needs building up in order to bring the teeth properly in mesh. Care must be exercised in building up the register rack to avoid a thumping noise which results when a register rack is "bottoming," i.e., the top of the teeth of both the cylinder and the rack are touching the bottom of the teeth in which they mesh. The rack is supposed to hold or rather set the cylinder in the proper position to be driven over the entire form for each impression.

Check Height of Form

When a slur is caused by the form being too high or too low it is the same as if the press had too much or too little packing. Slurs from over-packing generally show at the back of the form. It is always good to start an investigation into the reasons for a slur by checking up the form and packing to insure proper packing and type-high conditions.

Unseasoned stock is sometimes the cause of slurs or wrinkles. We know of one case where unseasoned stock caused a drag and slur inside of a large newspaper size sheet being printed on a cylinder press. This slur was due to the fact that the paper was larger in the center than at the outer edges, with the result that the sheet was forced to slur its way out of the impression because it had a greater surface to print in a given size than the form could accommodate—a slur and wrinkle resulting. Seasoning of the stock to permit it to become uniform is the obvious remedy for this condition.

The air plungers are important factors when a slur is being checked up and should be tested. These plungers should be set to allow just enough air in the chambers so as to make a cushion of air thereby permitting the cylinder to reverse without a jerk on the return motion.

Rollers On Cylinders

Rollers too, are great offenders at times. A slipping roller is a very difficult thing to detect. Lifeless or hard rollers are most difficult to use without slipping. As with platens, rollers should be tested for trueness. A roller may look straight in every detail and yet may be out of true with the stock or the outer surface of the roller, thereby causing trouble, as it will not ink all parts of the form with an equal film of ink. Rollers that are out of true are apt to slip when a soft bodied ink is being used. This slipping will show in streaks in the printed impression. It is good

policy to check up on doubtful rollers every day, especially when the weather conditions are such as to affect them.

A soft packing will create a slur for the same reason as explained for the platen press.

Other Remedies

The cylinder bands, the brush and the apron are all good points to check up when hunting the cause of slurs. The apron should always be extended to the extreme point possible without interfering with the form on its return on the reverse motion.

When card stock is being printed it will at times have a tendency to flop down to the form before it prints. Especially if the grain runs around instead of across the cylinder. This will make a slur on the back edge of the sheet which can be eliminated by putting wire brads or nails in the furniture outside of the type form to act as a rest for the sheet when it drops to the form. These nails are driven low enough to be clear of the rollers as they must not be inked or they will mark the sheet just the same as the form has done previously.

A tape or band around the cylinder in the margins of the job is another good way of holding a sheet up from the form. A small weight or a rubberband should be attached to the free end of the tape. This will keep it tight so as to protect the sheet at all times.

Rotary Presses

On the rotary type of press we find much the same causes for slurs. These conditions are met as explained for the other types of presses. Springy plates are one of the main offenders and, of course, when this is encountered it is necessary to make the curved plate hug the cylinder at all points—recurving may be necessary.

Soft packing, slipping bearers, too much or too little packing, and air pockets in the sheet are the main causes for this trouble on rotary presses. Plates must be ordered to conform with the cylinder cut requirements, and the packing needed must be kept within the demands made by the packing cylinder of the press.

Keep in mind the reasons for slurs, then search for the point at which this slip takes place and you will be better prepared to eliminate the difficulty.

Chapter XVI

Quality and Production

Finger marks could rightfully be named as the greatest offender against the cleanliness of the printed product. Every precaution may be taken in the preparation of a job regarding materials and workmanship and one smudge of a workman's finger will ruin an entire copy of the finished job regardless of the number of pages contained in the finished book. Perspiration is the reason for most finger marks. In sultry weather the workman's hand, regardless of its cleanliness, will leave a trace of dirt on a coated sheet especially if the sheet is of dull coated variety.

There are two ways of preventing these finger marks. The first method must consider the sheet before and during the period of printing. The second must cover that period after the sheet has been printed. The most effective way to keep the stock clean in the first instance is to furnish the paper handlers and press feeders or operators with cloth gloves of heavy and bulky variety such as can be purchased in the various department stores for about twenty-five cents per pair. Furnish these gloves and insist upon their being worn while handling lifts of paper stock. Clean sheets are a necessity and an investment of a few dollars a year will do much toward keeping a customer sold on the quality of the product.

The cutting and binding departments are the next offenders regarding finger marks. Their difficulty may be overcome by the use of talcum powder which should be sprinkled on the table of the cutting machine to prevent soiling the bottom sheet. Talcum powder should also be rubbed on the hands of the people doing the cutting and binding work. This will eliminate the finger marks and help them maintain higher efficiency in their work.

It would not be good practice to ask the man doing the cutting to wear gloves while working because he must have complete control of his hands at all times. Nor would it be advisable for paper handlers to use the talcum powder. Talcum powder on the sheet surface results in the impression being printed on the powder and not upon the sheet. The powder too, would fill up halftone plates and necessitate constant washup or scrubbing of the form.

Dirt and foreign matter, such as splinters of wood, nails and muck from the soles of shoes, take their toll through lost time in production. Every successful pressroom worker owes part of his success to a habit of watching for and catching this kind of foreign matter before it has a chance to pass through the press. It is not so much that the operator will get any credit for catching this dirt but that he will certainly be discredited if he fails.

Batters in plates or type may be caused by several things. A folded or torn sheet, especially in "seconds" stock, may crumple up and cause the damage but in most cases when the cause of a batter is located it is found to be some piece of dirt or foreign matter that should not have been in the stock or on the sheet when the impression was made.

Quality can easily be affected by filled up or dirty halftones. This dirt may be in the form of a "pick." It may be caused by dirty ink salvaged from some previous run. The trouble of fillups may also be caused by a faulty ink that may not be sufficiently ground or that may have been ground in a vehicle that permits the varnish to lift from the form to the sheet at each impression while the pigment or color sticks to the halftone. This fault may be remedied by reducing the ink with boiled linseed oil or oo varnish to help the ink lift the pigment during the impression.

Paper is inspected at the mill for imperfections in the manufacture and for all dirt and foreign matter which would affect the quality of the stock. Paper manufacturers know the need of cleanliness and use every precaution. Printers should train their personnel in the importance of cleanliness and elimination of foreign matter from paper stock and other materials.

The watchfulness of the pressmen will be reflected in the profit on the job. When a batter occurs it is up to the pressman to detect the trouble immediately after it takes place. If the fault is not detected readily, many sheets will find their way into the "bag," which raises the cost of the job and thereby reduces the profit.

Cylinder presses have a form brush to help hold the sheet to the cylinder to insure register on color work. This brush also helps to eliminate wrinkles in the sheet by removing air pockets from between the sheet and cylinder. The brush further tends to prevent dust and dirt from dropping on the form. It does not catch all the foreign matter because of its position on the

press which is below the center of the cylinder. It is possible for the dirt to fall off the sheet and on the form before it comes in contact with the brush.

Cardboard jobs that are cut on a Guillotine cutter are always broken at the edge along the bottom side of each card on the outside cut of the sheet. The inside cut which is under the clamp does not break at the edge. The minute pieces of these broken edges cause trouble for the pressman on jobs that contain halftone or solid line plates. The pieces fall off the sheet and stick to the halftone or solid printing plate.

The most efficient way of overcoming this condition is to allow enough stock on the sheet to permit a double trim. This double trim will permit each final trim on all lifts of stock to have the last cut made when the stock is under the clamp and the trimoff is outside of the knife. In this way the dirt gathered from the slivers of broken edges will be on the trim cut off and will be thrown in the waste paper box.

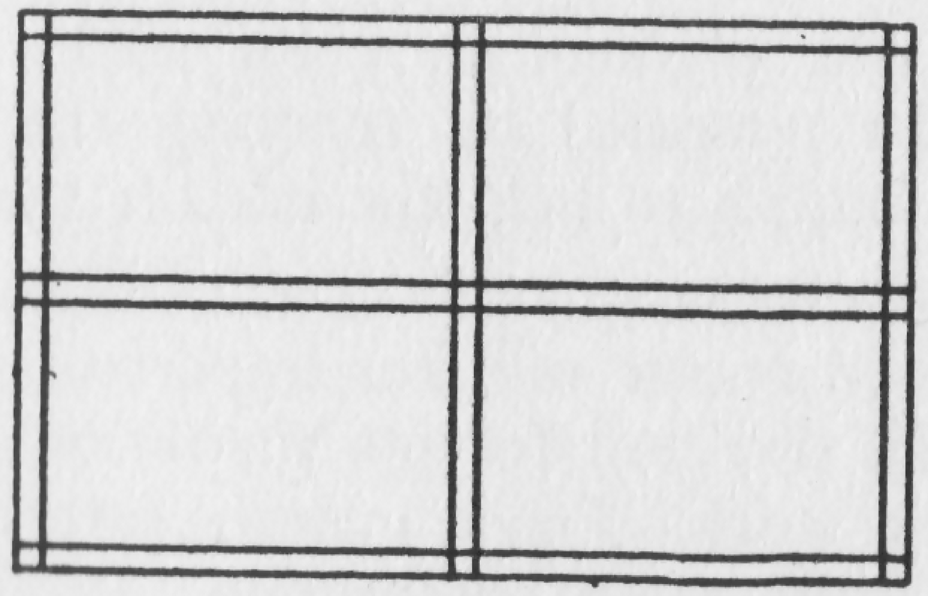


Illustration 16

A four out double trim job will require at least one-eighth of an inch trim on all sides of the individual press size sheet. When clean edges such as rotary cutting are required on the job it is best to consider the one-eighth inch trim on all sides of the finished sheet size on the job.

Sometimes this factor of double trim is overlooked when the job is laid out and stock ordered. This oversight will compel the printer to produce the job without the double trim. When this happens it is best to keep separate all the stock that has been cut when under the clamp, from those lifts of stock that have been to the outside of the knife when the cut was made. The lifts of stock under the clamp when cut will be free from the broken edges and fuzz and should print clean. The lifts that were outside of the knife when cut will have the broken edges

and fuzz and will cause trouble by sticking to the plate, rollers and form.

The Remedies for Fuzz

There are two ways to remove the fuzz. One is to use a stiff brush to remove the small particles of broken edges. The other is to buy a piece of eiderdown from a nearby department store and use it for an apron on the press by fastening it to the band bar and placing it between the bands, cylinder and brush of the press. The high nap of the eiderdown will catch and hold the particles of fuzz and broken edges and prevent them from falling on the form. This apron is occasionally removed from the press and cleaned.

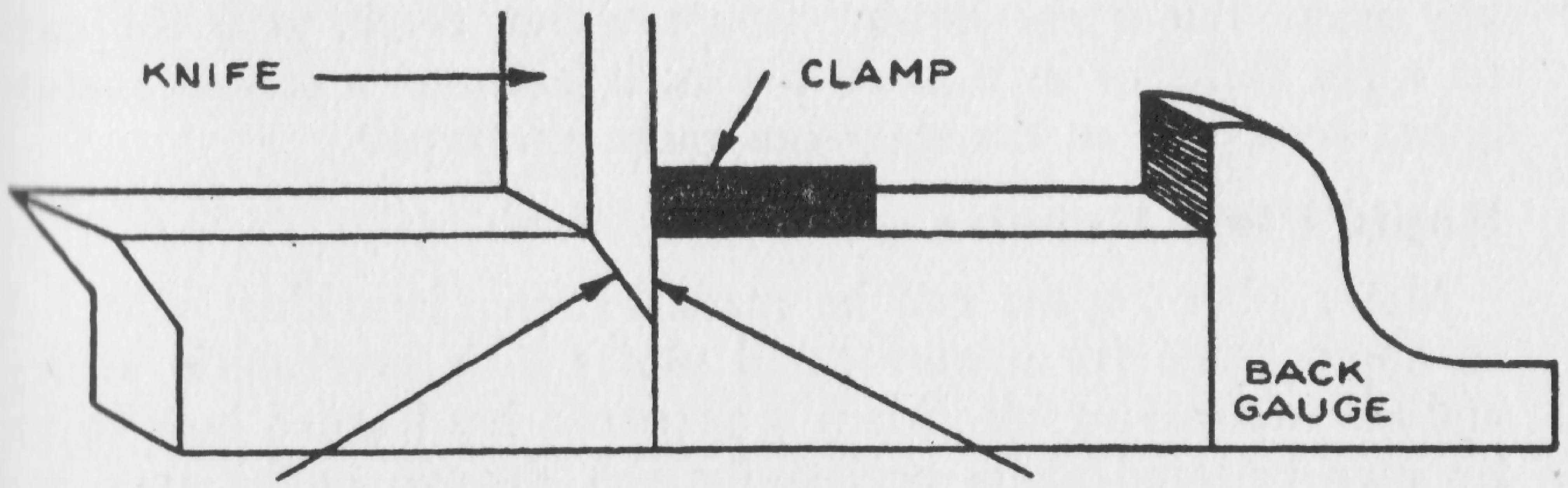


Illustration 17

This edge outside of the knife will contain fuzz and lint on the edge. Edge inside of knife and under clamp will have a clean edge.

The double trim method is the best and most economical method of producing a satisfactory job. The eiderdown is second best. Double-trim all your card jobs when possible.

Chapter xvii

Repairing Plate Batters

When batters in type forms are encountered it is only necessary to reset the battered lines or letters, patch up the indentation in the packing of the press and proceed with the job. When an electrotype plate or an original engraving is battered it means that the plate will have to be lifted from the form and sent to a finisher to be repaired. If the finisher happens to be close to the plant it is a simple matter to send the plate and have the boy wait. But if the finisher is not within reach, as is the case on night shifts or in isolated places, it becomes a serious matter unless some one in the shop can make the repair.

Rapid Plate Repairs

Minor plate repairs can be made by any individual who has an appreciation for minute detail plus a little mechanical ability and the necessary tools. Many a pressman has learned how to fix his own battered plates because he was thrown on his own resources.

There are four kinds of batters. 1. Those in text pages; 2. Indentations in screen plates; 3. Indentations in solid plates; 4. Indentations in line plates. There is a considerable range in batters extending from the minor variety, which we will explain here, up to the extensive kind which sometimes require new plates on the entire form. The most disastrous we know of occurred on a rotary press and was caused by a chokeup which permitted ten or twelve sheets to pass over the impression and battered every plate in the form. Of course, there is no hope of reclaiming plates in this condition, but a minor batter of a letter, word, halftone or solid plate, can be repaired with little effort.

When batters occur in the type section of electrotype text pages the copper face of the plate is forced below the printing surface of the plate. If the face of the type has not been broken it may be lifted up to the printing surface from the front side or forced from the back of the plate. (See illustration 18.)

Halftone or screen plate batters may be lifted by applying the pressure to the back of the plate. If the batter did not de-

stroy the screen the plate may be saved. If the screen or copper or nickel shell has been broken the plate is generally beyond repair.

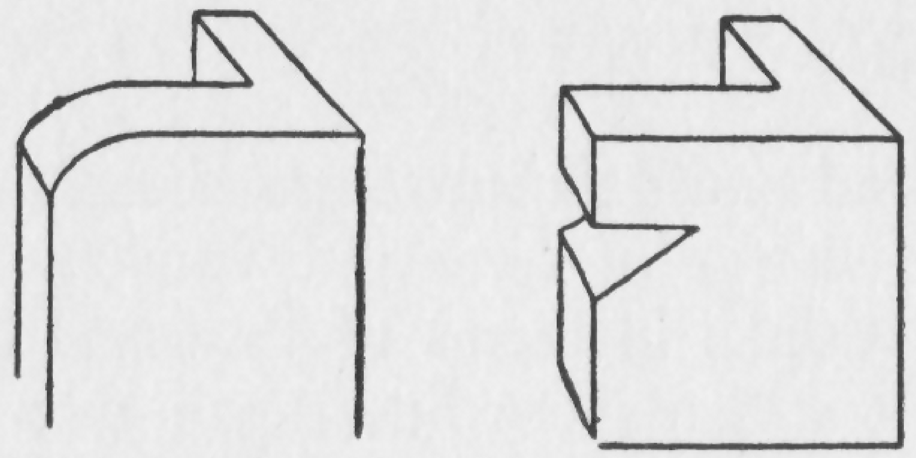


Illustration 18

A sharp edge, such as a make-ready knife, inserted into the low side of a letter will lift the letter up to printing surface. Care should be exercised in doing this so as not to batter the adjoining letters by using them for a fulcrum. Push the knife straight in the side of the type body.

Solid plates are the easiest to repair even though the copper or nickel shell is broken. When the shell is broken the battered hole is flooded with solder and filed even with the printing surface. Use a jeweler's flat file and some rouge paper (which is also a jeweler's product) for polishing. When the shell is not broken the batter may be hammered up from the back of the plate.

Line plate batters may be fixed as in the previous example by lifting the low part up to printing surface. This kind of batter may also be soldered on the printing surface and filed or polished to desired smoothness. Sometimes line plate batters are brought up from the back.

On type plates there is always the possibility of soldering in a letter or a line when the batter has destroyed the face of the type. This is the most difficult kind of repair to make, but it can be done with a little practice. The results are often amazing.

An employing printer in passing one of his rotaries one day found the press down and saw a small hook nicely embedded in the center of a solid line plate. He took one look and walked away in utter disgust. One hour later he passed again and saw the press running. He asked the pressman if he had had an extra plate on hand to which the pressman answered, "No, Sir." "Well, how did you get started so quickly?" he asked. The pressman then showed him the repaired plate on the cylinder

which he had filled with solder and finished off so nicely that it was not noticeable to the naked eye. An entire change of packing was necessary and the draw sheet had to be repaired, yet the whole operation was done in one hour.

Tools Required

The tools required could fit into a good sized cigar box. These tools should be in charge of some individual who appreciates the care of tools and thinks in terms of thousandths of an inch. A man of this calibre will make a fine repair man for batters. The tools required to make minor repairs are: Blocking hammer; center punch; nail set; machinist's taper pin; electric soldering iron; solder and flux; set of metal gravers including flat, round, elliptic, gouge and lozenge styles; blocking slab; brace and bit and 3/16 drill; hack saw and scroll saw; flat file, bastard cut; outside caliper; finishing rubber; blocking nails ⅝ of an inch long; Scotch stone (water of ayer) or charcoal; jeweler's rouge paper for polishing. A kit of tools should also contain a set of roulettes, rakes, or line gauges, a one-inch micrometer and a pair of pliers.

The blocking hammer is equipped with a ball pean which is used for tapping the back of plates when the batter is of large proportion. The center punch is used to pierce the nickel shell when reblocking the plate. The nail set has a concave end which is used to set the nail in the metal of the plate.

A taper pin about three inches long has two convex ends, one is a little bit larger than the other. The convex ends permit of driving the back of the plate, under the batter, up to the printing surface in a gradual manner because of the convex end of the taper pin which is used for the punch. The brace and bit with the drill is of ordinary kind and is used for drilling the hole in the plate for the scroll saw. The scroll saw is used to cut the groove for inserting individual letters or words of type.

The flat file is used for filing the rough places on the bottom of the plate such as those caused by removal of plates from wood blocks. The outside caliper is used for locating, on the back of the plate, the exact position of the batter on the face of the plate.

Electrotyper's finishing rubber when rubbed over the face of the plate will reveal the low spots. The rubber polishes the high spots. Low spots are shown up by the unpolished parts.

Everyone is familiar with the blocking nails and their use. It is best to use the small head nails if they are to be driven between

close lines of type, although the large head nails will hold better than the small heads.

The water of ayer, known as Scotch stone, or a piece of charcoal, is used to polish rough spots on the printing surface of the plate. Scratches in solid plates are generally burnished out of the plate with the face of the hammer. For this reason the face of the hammer must be kept free from scratches. The scratch in the plate is burnished with edge of the hammer until the printing surface of the plate is even with the bottom of the scratch. The Scotch stone is used to smooth off the rough places. The jeweler's rouge paper will also polish without scratching, and can be used to good advantage with the Scotch stone.

On the red of a four-color process plate of a girl's head there sometimes is a need for more color on the cheeks. This requires a wider dot on the cheeks. A Scotch stone can be used to good advantage in rubbing or burnishing these dots to a wider printing surface.

The metal gravers (engraving tools) are used to clean up any dead metal that may have been forced up with the battered part of an electrotype plate. Double rules in electrotypes of type plates at times become filled up. They can be cleaned out with the thinnest of these engravers tools.

The blocking slab referred to is an electrotyper's finishing slab made of cast iron, the smallest size being 16x24 inches. Any flat smooth steel surface will answer the purpose such as an old discarded platen press bed or a cutting machine table or an imposing table.

A batter which is being driven up from the back of the plate should always be driven against a flat hard surface and never against a soft surface because the battered part being driven to the printing surface will go beyond the printing surface of the other part of the plate if driven against a soft surface. Never put a sheet of cardboard under a plate when you are driving up a batter. Put the plate directly on the hard surface, face down and be sure the surface is free from dust or dirt. A minute particle of dirt will batter the printing surface of the plate.

Cleanliness is absolutely necessary in soldering. Grease or dirt must always be removed from the spot to be soldered or the solder will roll off and will not hold. Scrape, scratch or clean the prepared copper surface with muriatic acid which has been

killed by injecting a small piece of zinc in the raw muriatic acid. Soldering paste prepared for this purpose is also good.

Remember, too, that a prerequisite to success in repairing all battered plates is to keep in mind the fact that two light taps with a hammer are better than one heavy tap. Go gently with every move in making these repairs lest you damage another part of the plate more seriously than the batter you are trying to repair.

It is necessary to nail blocked plates back in exactly the same position on their blocks because of the register in the job. Before replacing the plate be sure all the burrs are filed off the back of the plate or they will interfere with the impression. To insure the exact previous position place the plate on the block and insert nails in the old holes at the opposite corners of the plate. Don't use any of the other old nail holes but drive the nails in new positions in the plate. If the plate is nickel face, it will be necessary to use the center punch to drive through the nickel and then drive the nail and set it into the metal of the plate with the nail set. Unmounted electros for patent bases are lifted off the base, repaired and returned to the same position without difficulty.

Repairing A Battered Line Plate Electrotype

1. Find the position of the batter on the back of the plate: (a) By the use of the inside caliper. Mark an X in the exact center. (b) Or, measure distance with rule from edges of plate and mark X in exact center. Consider the shoulders of the plate in the measurement. (c) Or, trim closely an impression of the page containing the batter and paste on back of plate. Plate is face down, pasted sheet face up. This will show the exact position of the batter.
2. Place plate face down on smooth hard surface or a blocking slab. Be sure to remove dirt from slab and plate.
3. Place taper pin on X mark and strike a gentle tap with the hammer. Look at the front of the plate after each hammer tap.

Halftone plates are repaired in the same way, but a great deal more care must be exercised in handling the plate. Never hit the back of the plate with unnecessary force because this will cause the bottom of the halftone plate to come up to printing surface and print. The plate in this condition would have to be tooled out with a line tool and this requires more skill than most pressmen possess.

Type plates that do not have the shell broken may be lifted up to printing surface. If a letter is broken, a new type character may be soldered into the plate. It is not advisable to solder more than one short word in the plate because of the difficulty in aligning the letters.

A single broken letter repair would be made as follows: 1. Drill hole opposite batter and insert scroll saw and saw out battered letter. Keep the hole as small as possible to hold the type in place. 2. Place the plate face down on blocking slab and put new type into hole sawed out for purpose. Don't cut body of type but stab metal of electro against body of type to hold in position when ready to solder. Now lift up the plate and examine face to see if type aligns. 3. Put soldering flux on the plate. Place small pieces of solder on base of type at back of plate. Touch solder gently with iron until it flows in the hole and take soldering iron away and permit solder to cool. A quick application of the iron to the type if small size will melt the body of type at the plate. 4. File back of plate at point of repair and plate is ready to be put back into form. (See illustration 19.)

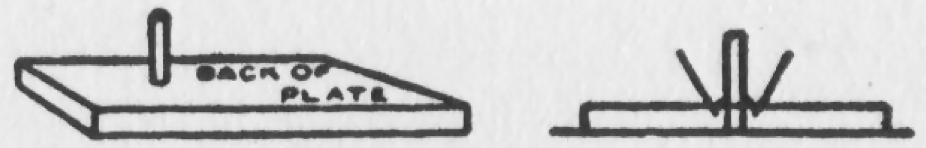


Illustration 19

Hold letter in position by stabbing the metal on the back of plate against the letter to be soldered in for the correction or batter

One of the most handy tools for the pressman who wants to relieve pressure on vignettes from the back of the plates is the bearing scraper used by automobile mechanics in fitting bearings in a car. This tool removes a thin layer of metal from the back of the plate with very little effort.

When a curved electro is to be repaired it is necessary to have the battered point resting directly on the blocking slab. This can be done by tapping the back of the plate until a solid sounding tap results. Keep the plate in this position for the repair. If this is not done the result will be a bumpy printing surface which will cause trouble.

A carpenter's small planer is an ideal tool for putting bevels on plates to be run on a patent base. Register work at times needs to have excess metal shaved off the bevel. The planer will do this very satisfactorily. The ends of the plate can easily be planed by holding the plate edge about one-half inch off an ordinary table and sliding the plane across the extended edge.

Chapter XVIII

Blocking Out With Borders

There are times when corrections are made on printed letterheads, billheads, business cards, and the like, to save reprinting the entire job. Reprinting the job is, of course, the best way to handle corrections but it is often thought to be too costly. Changes in customers' jobs at times do not permit of condemning the job for reprint. It is necessary, therefore, to adopt some manner of blocking out the undesired part of the job in such way as to make the correction appear as an ornament rather than a correction. When this has been accomplished it is possible for the customer to pass out the material as first class work rather than a corrected job. This operation is quite important to sample houses that show their products on printed sample sheets or cards.

Changes of important information frequently occur in the letterhead field where such corrections as telephone numbers or names of discontinued products, make the letterhead useless without the correct information. All merchants, unfortunately, have not as yet learned the importance of a representative letterhead. Many insist upon some form of blocking out the undesired copy.

The supposed economy on a job of this kind lies in the fact that the paper stock will be wasted unless it can be attractively corrected. The original composition, too, is supposed to be saved, as well as the time consumed in make-ready and running of the original job. There is really very little saving in blocking out and imprinting on any commercial jobs except where the correction can be made ornamental. The slight saving in paper stock is the only real economy in the operation, for the time consumed in resetting the job as well as the make-ready and running is not very different for the reprint from that for the original job. Running, of course, is usually supposed to be the same, but actually it requires more time to strike in a correction than to re-run the job. In any case none of these supposed savings can compensate for anything unsightly in the job. The prestige of a house is represented by the stationery it circulates in its industry. This is a very important decision for any client for he should

be persuaded to weigh the advertising value of every piece of publicity he sends out—especially letterheads, as they are the ambassadors of all who use them and they should be representative of the firm.

No matter how wise a printer may be, there will be some customers who will not agree to have the job reprinted. They want the correction made on the old job. It is then necessary to determine which method of imprint will be most effective. There are several methods of blocking out and imprinting. All methods are not successful if complete obliteration of the undesired part of the job is necessary.

Four Methods of Blocking Out

Four methods of blocking out are in vogue today, namely: rules, solids, bronze, and ornamentation.

The rules method is easiest. In cases of this kind the customer is not likely to be particular about the correction and the appearance of his job. In striking the rules through the part of the job to be obliterated it is best to have the original guides to insure perfect register. When this is possible, the rules together with the correction line are put on the job in one operation. If the original guides are not to be had, such as on a job run more than one up and cut apart, the appearance of the job depends upon the accuracy of the cutting of the job and the possibility of keeping all the lifts together. A ten-point type may have two or three two-point rules running through the line. The original line of type can be distinguished in this method.

The solid block method of obliterating a line of type is the one most generally used, but is by no means the most effective. In this method the solid electrotype, which is cut to fit the size of the line to be blocked out is locked up and made ready for running. The same importance as explained in the rules method for maintaining register also prevails in this method and, in fact, all methods. The running of the solid block method generally calls for the same color ink as was originally used for the first run. When the solid is printed over the line to be struck out the type part of the line carries two layers of ink and the balance of the solid carries only one layer of ink. The type can sometimes be read through the solid by moving the sheet so that the double layer of ink on the type line will show through the solid. This method is the first one generally thought of when blocking out type. It is not the most successful method for the purpose.

The idea of putting a gold bronze impression over a desired change is effective as regards the obliteration—but it is also the most costly because bronzing is generally a hand operation. It will eliminate the desired type matter, providing the bronze does not tarnish on those parts where it prints over the type—in which case the type can readily be read through the tarnished parts. Single impressions of gold or silver ink are not sufficiently opaque to overprint corrections of this kind and their use is discouraged for such work.

The best and most effective way of eliminating a type line in this blocking out method is to use an ornamented design for the overprinting. A design that contains approximate line thickness as contained in the body lines of the type to be blocked out is the most effective. When a line of type is overprinted with a design of similar line thickness, the body lines of the type form a design with the lines of similar thickness in the design and in this way eliminate the type lines completely. The result is ornamental and the substitution will not be noticed unless attention is called to it.

Any of the filigree designs made by the American Type Founders or machine casting matrix manufacturers can be used for this purpose. The egg and dart border has played an important part in doing this work and answers the purpose admirably.

Chapter XIX

Patent Base Speeds Imprint Jobs

Changes in type forms for imprint work are easily handled by the manipulation of either the type or slug—whichever the case may be. When the run is large enough to have the main part of the form electrotyped, the changes can best be made on the patent base.

Individualizing, that is imprinting a booklet or a letter for an individual person, the change occurring after each impression of the press, requires such special presses as the Kier Press which prints from linotype slugs on a platen style press and makes a complete change of name and address after each impression. This press is also equipped to print letters through silk to imitate the typewritten product.

All large runs of commercial printing that require many changes create a problem in estimating the time required for making the necessary changes. If a patent base is at hand a run of this nature may be produced with the minimum time required per change provided the entire job is laid out and studied before electrotypes are ordered.

Assume that the job in question is for letterheads, size 8½x11, quantity 200,000, and the job is to be produced for a large corporation with branches in many cities. Each branch is to have its own address imprinted on the letterhead. The balance of the letterhead is to be similar in all respects. The job is in a rush in that all branches must have letterheads as soon as possible.

The rush condition of the job necessitates using a stock size sheet 22x34 to be run 8 up on a No. 2 Kelly press or half this size to be run 4 up on the No. 1 Kelly press if need be. The job will be explained for the 8 up proposition.

The O.K.'d copy would permit a release of the individual type form which should be locked up and sent to the foundry with an order for eight electros for patent base, beveled close on three sides, and allowing a half inch shoulder at the foot of the electrotype. The finished electrotype would look as shown in illustration 20.

The change in this particular case is the address which is designed to appear in the exact center of the letterhead as shown in illustration 21. The total number of imprint electrotypes required should be determined before any of the addresses are set up and sent to the foundry. This is necessary because the length of the run of the various cities will determine the number of imprint electrotypes for each city that are required for the order. It may be necessary at some parts of the run to put back some of the imprint electrotypes that were previously removed in order to fill up the form for the city imprints which require short and irregular quantities. It is not necessary to use higher mathematics to determine at what points in the run these various changes are to be made. Simple arithmetic will help determine how many changes of each electrotype are necessary in the entire run of imprints. The largest quantity for the most important branch permits of using these imprints to take care of the uneven quantities that are demanded by the smaller branches. For this reason it may be necessary for the printer to order eight imprint electros for the largest quantity demanded by the main branch office to accommodate the eight imprints demanded by the full size sheet.

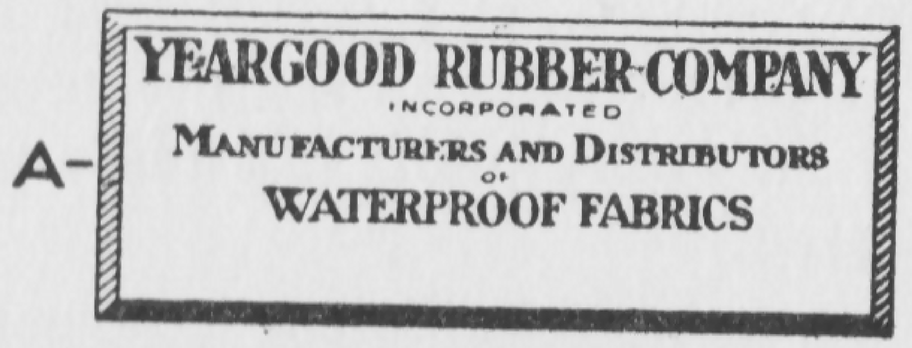


Illustration 20

Illustrating how type must be kept close to top edge of electrotype with half inch shoulder at bottom edge

After these plate quantities are known the order for the imprint electrotypes is placed with instructions to allow at least one-half inch shoulder (below the type) at the bottom of the electrotype and to trim and bevel close to the top of the type on each plate. (See illustration 20.) The distance from the top of the type to the bevel on the electrotype is very important for this distance determines the position of the imprint on the finished job. These electrotypes are ordered in dimensions long enough to permit of getting at least two hooks along the length of the electrotype. This feature will determine what length these imprint electrotypes must be. Order electrotypes to be

beveled the standard bevel of thirty-five degrees on all four sides.

Adjusting the Electros

After all these electrotypes have been received the eight electros containing the main body of the letterhead are sawed and filed to permit of positioning the imprints in the following manner (see illustration 21): Locate in the shoulder section of this electrotype the exact position required by the imprint electrotype and draw a line in the electrotype shoulder with a bodkin. Be sure this line is parallel with the type contained in this electrotype. Then saw along the scratched line with a hack saw or circle saw stopping at the right-hand side of the imprint electro. Saw a notch from the bottom edge of the electro to the line scratched in with the bodkin. Do this on all eight electros. Place the electro on a table face up and file a thirty-five degree inverted bevel along the sawed line which bevel is to correspond with the bevel on the imprint electrotype. The finished filed electrotype and imprint will look like illustration 21.

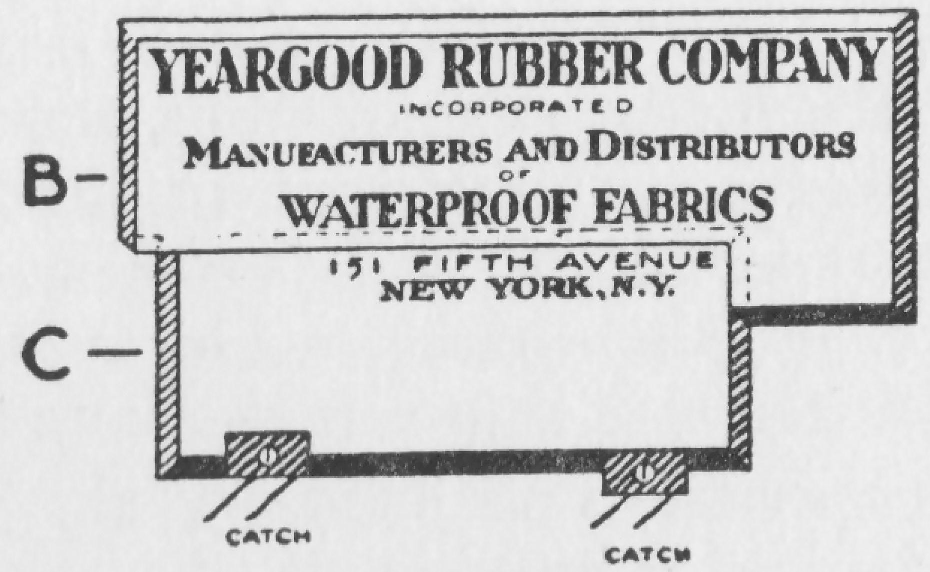


Illustration 21

Showing how imprint electrotype fits into shoulder allowed on letterhead electro

Be sure to bevel along the right-hand side of the imprint electrotype as this provides a secure hold in this corner of the plate. The distance from the edge of the plate in this corner is also important as it controls the side-wise position of the imprint.

After all electrotypes are sawed, filed, and beveled and ready for the press the form should be made up on the patent base with the letterheads made up head to head. Patent bases of the grooved type generally have the grooves from one to one and one-half inches apart. It is necessary to make-up and lock-up these eight electrotypes so that you get at least three hooks at

the head of each plate and two at the foot of each plate with at least one hook at each side.

There must be enough space allowed between the two foot hooks to permit of making the changes in the imprint without molesting the original lock-up in the form. It is best to make the first run of the electrotypes and imprints in this manner. This will permit of making additional changes without taking the body electrotypes off the patent base and filing them to accommodate imprints after the first run has been made. Imprints should be filed correctly to make them interchangeable. The patent base is locked in the bed of the press and the necessary line-up performed on the sheet. The imprints for the first run should be inserted in this first lined up sheet which can be used for a guide in position of the imprint changes that follow.

Adjustment of Hooks

The imprint electrotypes are placed under the filed bevel of the original electrotypes and fastened with two hooks at the foot of the imprint electrotype. (See illustration 21.) It is not always possible to get a side hook on this imprint and in the event that no side hook can be fastened it is suggested that a groove be filed at the foot of the imprint electrotype where the outside hook is fastened. This groove or notch will act as a holder for the imprint and will not permit it to move out of position designated by the line-up. This notch and imprint electrotype will go together as shown in illustration 21.

If perchance, the electrotypes used for the imprint are not beveled in exact parallel alignment to the type the difficulty may be overcome by inserting a small strip of paper or cardboard about one inch wide in the proper position between the imprint and original body electrotype. This strip is inserted in the end of the imprint electrotype which is crooked because that end of the imprint is too close to the original body electrotype. This strip should be as wide as possible because it really represents the contact point between the imprint electrotype and the original electrotype which should, naturally, be as sturdy as possible.

The make-ready required on changes of this nature when planned as explained herein is reduced to a minimum because it is generally possible to place the make-ready underneath the imprint electrotype. In this way the make-ready can be performed while the imprint electrotype is being adjusted to its

proper position. Underlays of this nature can be made up of tissue, folio, or pieces of its own stock, whichever the case may be.

Substitute Nail for Hook

If it is not possible to get sufficient hooks along imprint electrotypes of this nature the imprint changes may be nailed onto the patent base by first inserting into the groove a strip of wood sawed to a tight fit corresponding to the width of the groove and with sufficient allowance for clearance according to the depth of the groove. These strips of wood are gently forced into the grooves. The imprint electrotypes are then placed in position and nailed to the strips of wood in the groove. The small wire brads, which are used for nails, spread the strips of wood in the groove, thereby making a tighter hold for the wood and electrotype combined. It is possible to nail small imprint plates of this nature on rotary presses that are equipped with the groove type patent bases, provided, of course, that the curved requirements of the cylinder and plate do not interfere with the length of the wood strip required for the nails.

In the event no patent base is available for the job it is still possible to make the changes explained herein using a laminated wood base for the original electrotypes and base. Of course, changes of this nature on a laminated wood base are more costly than on a patent base because of the time consumed in making the changes themselves and adjusting the imprint to proper alignment with the original electrotypes.

Laminated wood suitable for a base of this nature may be purchased in almost any lumber yard at a price of about fifty cents per square foot. Extra precautions are also necessary when using this wood base because the wood itself is trimmed to a standard 13/16 of an inch in thickness. This factor makes stringent demands upon the printer and the electrotyper because of the necessity of bringing the total height of the electrotype and the wood base to .918 of an inch. The 13/16 of an inch is equivalent to approximately .8125 of an inch. Type-high being .918 and this laminated base being .8125 leaves a difference of .1055 of an inch. This difference demands precaution in preparing the electrotype which must be changed from .152 of an inch to a thickness including this .1055 of an inch. This can be accomplished by the electrotyper by planing down the plates, but we must bear in mind that when we deviate from any standard measurement we frequently encounter difficulties. Upright grain base used by

box manufacturers will answer for a wood base of proper height required for .152 electrotypes. American quad plate base and quad register hooks could also be used with facility on imprint jobs.

The line-up and preparation for a form to be produced on a wooden base would be the same as explained for the patent base with the above noted additional need for accuracy because the plates would have to be moved around into proper alignment for line-up. In lining up this sheet it is best to put only two nails in the plate—one at each end. Tap the plates into alignment, then nail plates down securely. The two nails per plate will hold until the proper position is secured.

Molded rubber plates are also used successfully on imprint jobs. The type set for the imprint changes is molded in rubber instead of the electrotypes explained above. The molded plates of the imprint changes are treated with a "sticky back" compound. This "sticky back" imprint plate is placed into position as shown in illustration 21, page 105, and pressed against the laminated wood base block. The "sticky back" holds the imprint rubber plate in position without the use of nails, hooks, or other appliances.

If and when the "sticky back" treatment is not available, a double face scotch tape will also hold the rubber imprint plate in position during the run.

This double face scotch tape will also hold the electrotype plates previously suggested for this imprint work without hooks or nails if a wood base must be used for the job. This double face scotch tape has been used successfully in this kind of work on all kinds of presses including platens, automatic jobbers and newspaper web presses where 16 gauge zinc plates are fastened to stereotype base dummies with double face scotch tape and run in regular daily "run of the paper" jobs.

For guidance in make ready and run of molded rubber plates see page 49, Printing Water Color Jobs.

Chapter XX

Printing On Cellophane

In the effort to print on cellophane the problems encountered have proven costly since the results obtained have not always been acceptable to the customer. For this reason, most printers who have had any experience in printing on cellophane have kept their experiences to themselves with the result that every new user has had to make just another attempt to find the same result.

Although it is natural for every printer to use the things he understands best on all his problems, materials and methods of production must be changed to conform to the product being printed. Thus the peculiar demands of cellophane prompted the use of aniline inks and a specially made press to run the product in a satisfactory manner.

Cellophane printing will be discussed in two parts—one covering printing with aniline inks, the other, printing the product with an oil base ink on regular letterpress equipment.

According to the monograph, "Printing on Cellophane," compiled by the United Typothetae of America, the processes of manufacture for plain and moisture-proof cellophane are as follows:

"Cellophane—The raw material is pure wood pulp, first treated with caustic soda, then with carbon bisulphide. The product thus obtained is completely soluble in water, and the solution is called viscose. Viscose coagulates or solidifies very rapidly when brought into contact with certain salts or acids, just as the white of an egg does when it is brought into contact with boiling water; and this cellulose solution is used for the manufacture of both artificial silk and cellophane. It is only in the method of fabrication that these two products differ. When artificial silk is made, the viscose is forced through a nozzle having a number of minute holes, and all the filaments obtained are solidified as they pass through a coagulation bath. The reunion of the filaments constitutes a silk thread. In making cellophane, the viscose passes into a manifold and is forced through a slit-like aperture into a coagulation bath where it solidifies in the form of a sheet, then it is treated chemically to eliminate all foreign matter. Washing and drying complete the process and the final trans-

parent product is a sheet approximately 32 to 36 inches wide, from .001 to .006 of an inch thick, and of indeterminate length.

"Glassine paper is a wood-pulp product in which the form of the fibre has not been essentially changed. It is a better product and is manufactured from sulphate pulp worked in the beater for a much longer period than would be required for ordinary paper. A stone beater roll is generally used and continued beating beyond the period ordinarily required for paper hydrolyzes the fibre and gives it a transparent, rather gelatinous finish. Upon tearing a sample of glassine, it would be easy to identify the individual fibres under a magnifying glass along the torn edge, which is not possible in cellophane. Cellophane, on the other hand, is a solution of cellulose in which the fibre, as such, no longer exists. It may be described roughly as artificial silk or rayon in sheet form."

With the outline of what these two products contain it should be easier to trace the proper methods of handling them during the process of printing.

There are two kinds of cellophane, plain and moisture-proof. The moisture-proof cellophane contains all the characteristics of the ordinary cellophane besides being moisture-proof. Plain cellophane is available in six thicknesses—.0008, .0012, .0017, .0034, .0051 and .0068 of an inch. The moisture-proof type comes in thicknesses of approximately .0008, .0012, .0017 of an inch.

The greatest problems encountered in printing on cellophane are those that concern ink, handling of sheets, folding and cutting. We shall cover these problems in this same order, as well as discussing the proper kind of make-ready and kind of packing and plates to use.

Inks for printing on plain or regular cellophane are being supplied by the ink manufacturers without much difficulty, aside from the need for opaqueness so necessary on this highly transparent product. The first color used is usually opaque, and when additional colors are necessary they generally are transparent. This first color frequently is an opaque white which serves to take the place of the white paper stock on an ordinary job.

Printing ink dries by oxidation, absorption or both: cellophane has no absorbing qualities—hence the necessity of an ink that dries by oxidation. The moisture-proof cellophane, especially, requires an ink that dries by oxidation as this cellophane has a coating that resists most efforts of printers and chemists in getting an ink to work satisfactorily and to dry without rubbing

off the sheet. Some printers use an application of heat to overcome this condition, as it has been found that moisture-proof cellophane requires about 125 degrees Fahrenheit to open the coating of the stock and permit the ink to get into the sheet and become part of it after the ink has dried.

The oil-base inks also give trouble through offsetting and sticking together. It is best to insist upon a full-strength color when buying ink for cellophane printing. The ink should be a specially made one—the ink man being told what it is to be used for. As an added precaution against trouble tell the ink man all you can about how the job is to be run and just what kind of stock will be used. Full strength inks give the desired color with a minimum film of ink; a minimum film of ink will seldom offset or stick to other sheets. It is when a special color of ink is required that the flow of ink is increased on the press, making the film thicker than can be absorbed and oxidized without sticking together and offsetting. A full-strength ink will give the true tonal value with the thin film of ink. If this color is not deep enough, the ink color should be made deeper and the same film thickness maintained throughout the run. The change should be made in the ink and not in the quantity used for the impression.

Every time a quick drying ink is required, the ingredients to accelerate the drying are incorporated in the ink. It should be obvious, therefore, that the ink will dry quickly on the press as well as on the paper stock, because the film of ink on the press rollers is not much thicker than the film of ink deposited on the sheet. This quick-drying problem works a hardship on the press crew and reduces the product of the press because of the frequent washups. To overcome this condition, a press without rollers would have to be perfected, so as to keep the ink from drying until it was spread out in a film on the sheet. This condition is now met by the aniline ink and the special press and fountain used. The aniline ink dries almost instantly, has an extremely strong tonal quality, and is applied to the printing plate with the use of only two rollers, one which revolves in the fountain of ink—which is very thin—the other which deposits the ink on the plate. The fountain roller is regulated to a fixed quantity, which is transferred to the form roller, and from there to the form. The printing plate, especially on bag-making machines, is made of rubber and fastened around a cylinder. This kind of plate naturally limits the kind of work that can be done on this press.

Aniline ink, therefore, is giving the desired instantaneous drying without frequent washups. This ink overcomes the ink-drying difficulties of moisture-proof cellophane without need of applying heat as is required with oil-base inks. In the aniline ink, the dryer is in liquid form and when put into the ink penetrates the coating of the cellophane. The ink is thus bound to the sheet and will not rub off when dry. The special aniline ink type of press prints from a roll—the most economical method of production. These presses are equipped to print and re-wind the sheet or to insert the printed web into the bag-making machine.

Plates and methods of make-ready for the relief method of printing with an oil-base ink require the usual precautions. A hard packing should be used. Steel-face electrotypes should be used in preference to copper-face electrotypes. This precaution is usual on this kind of plate in order to maintain the highest brilliancy possible while printing colored inks. It is for this reason that stereotypes, zinc line plates, and type forms are not recommended for this kind of work.

The printing of cellophane in sheets presents a problem of handling, the moisture-proof variety being very slippery and hard to handle. It is most difficult to feed and presents a serious problem when a close register job is to be produced on either job or cylinder press. In order to maintain perfect register in sheet-feed work it has been found necessary to mount the cellophane on a base sheet, in a similar way to that in which silk is handled. The difficulty in this method is the fact that, at the present time, it is hard to find a suitable adhesive for sticking the cellophane to the backing sheet long enough to print the cellophane, which will then allow the backing sheet to be removed without affecting the finished job. Some printers use wire staples for this purpose with satisfactory results. Some web presses carry a backing sheet for cellophane in much the same manner as our offset roll.

Make-ready Not Difficult

The make-ready on the special aniline presses with the molded rubber plates is not very difficult. In some instances the plates are leveled up on a special proof press in order to reduce the make-ready time when the plate or form goes to press. The form in this kind of work is generally of small size with few units of printing spots. For this reason the pre-make-ready is

effective. The rubber plates are stretched around the cylinder of the proof press and leveled up in the ordinary manner.

Coarse-screen halftone plates are best for printing on thin papers since such a screen gives a better chance for the dot to show up properly. A screen of 85 lines to the inch should give one a chance to print each dot clearly. A trial in this respect is the best way to judge for results. One feature of cellophane is the fact that the transparency of the sheet is really desired because the merchandise wrapped is supposed to be examined through the wrapper. An over-all design is seldom used—a factor that makes for small printing forms.

Aside from the handling of the thin sheet, the problems of offset and sticking together make constant vigilance necessary in order to produce an acceptable job. Some men rack the sheets to prevent both the offset and the sticking, as some jobs do not permit of piling the sheets.

To Prevent Sticking

In cases where the sheets must be placed on racks they should be spread over the entire area so that no sheets touch the printed surface of the sheets already printed. The spray guns used for the elimination of offset on regular letterpress equipment furnishes another method of preventing cellophane sheets from sticking together. Still another method of eliminating offset and sticking is the application of the old method of pinning up the sheets, used by label printers. The pinned sheets are placed in a specially built truck that permits of hanging the sheets by pins inserted in one end of the printed sheet.

Humidity affects the cellophane sheets. Because the fibre in the cellophane sheet no longer exists after the sheet is made it is difficult to determine just what will happen when the sheet changes. The paper stock sheet changes the greatest distance across the grain when such papers stretch in humid atmospheres. The cellophane sheet has been known to shrink under the same conditions.

Cellophane does not fold satisfactorily in dry atmospheres—it has a tendency to crack. This is also true when the sheets are trimmed after folding. This condition can be eliminated by subjecting the cellophane to a dampened atmosphere before it is folded or trimmed.

A new use of cellophane is in supplanting onion-skin stock for duplication proofs used for intaglio and offset. Proofs for

this purpose are dusted with lamp black or bronze powder to increase the opaqueness of the type while it is under the arc lamp.

Be careful when arranging for the production of a cellophane job in sheet form. Use every precaution possible, watching every operation with greatest consideration of what may happen if the job gets beyond control. Accept the fact that production on this kind of work is greatly reduced. Watch for and make every effort to control the curling of the stock as this factor alone may ruin the register.

Chapter XXI

Details of Embossing

There are several kinds and methods of embossing in use today. We are interested in the letterpress press method whereby the printer can emboss his own jobs on his own equipment. Special kinds of embossing include the printing and embossing done on small seal machines and the embossing handled in the Thermographic and steel die stamping industry.

The success or failure in each embossing job can be attributed to the method of making the counter or "force." There are several kinds of counters being used. The one of most value or best understood is generally chosen by the individual making the force. The constituents of these forces vary from ordinary blotting paper to strawboard and glue, sodium silicate (better known as liquid glass), automatic repressed blanket, dry shellac, fire clay with silicate of soda, paste and plaster of Paris, and special compounds that are in use today.

In order to simplify the explanation of methods of building these various counters or forces, we will assume the use of the universal style of platen press for the process. If the female die which is generally made of brass is not mounted, it will be best to have it sweated (soldered) on to a solid metal base. Both die and base should not measure more than type-high, .918 of an inch. It is also possible to fasten the female die on to a metal base with glue, if the glue is properly applied.

Glue Viscosity Important

The trick in using any kind of cold glue is to apply the glue in generous quantities to the surface of the object to be glued, then take a piece of strawboard and press it into the soft glue which has been applied to the surface of the object to be glued. Hold two edges of the strawboard in one hand and quickly raise the strawboard away from the soft glue about six inches. Repeat this motion and increase the distance until the glue separates into myriads of minute strings which look like silk fibres. Move over the entire surface of the object to be glued while going through this operation of turning the glue into fibres. When the glue is at the highest point of "stringiness," it is also at its greatest

point of viscosity. Plates glued in this manner are most likely to adhere firmly to the object or base to which they are fastened. When cold glue is used without this method of creating the stickiness, the results of the operation will be in doubt, especially when two metal surfaces are being glued together.

Another prerequisite to success in gluing two metal surfaces is cleanliness. Each surface should be free from grease as well as other foreign matter.

Two rough surfaces have a better chance to be glued together than do smooth surfaces, if the glue is in the right condition, because the interstices caused by the roughness create wells for holding the glue. When the glue is in a condition to adhere immediately, it will hold the two objects firmly, directly upon their being placed together. If the glue is not in condition to adhere immediately (as when the quantity is too generous and not worked into a stringy condition) the roughness of the surfaces will hold the glue in a liquid state and if the air cannot get to the glue, the glue will remain liquid, and naturally will not hold the plates together. It has been suggested that a piece of tissue be placed between the plate and the base to obviate this possibility. This will not be necessary if the glue is worked into a state of viscosity before the two surfaces are placed together.

Blotting Paper Counter

The blotting paper embossing counter is the simplest one to make. After the female die is locked into a chase and placed into the platen press (Universal) the die should be inked with a brayer. It is not necessary to put the rollers in the press for this operation, because the impression is wanted only to show the outline of the outer edge of the die. The next operation is to take a sheet of strawboard, basis 26x38–80, and cut it to size by making it 3 to 4 inches larger than the sheet to be embossed. This excess should be both ways of the sheet. Glue this sheet to the platen of the press in the same manner as explained for gluing the die to the base. Rub this sheet flat. Next take another piece of strawboard about one inch larger than the die to be used for the embossing. Place the glue on the sheet, draw it out to stringiness, and glue it to the first piece of strawboard. Now pull an impression by holding a clean sheet over the strawboard. If the impression is sufficient to see the edges of the die, pull an impression on the strawboard and trim along the inside edge of the die, allowing a trim off of about 1/16 of an inch.

Try not to get an over-abundance of ink on this impression because the grease will affect the stickiness of the glue.

Next take a piece of blotting paper, about 90-pound basis, 19x24, and cut it to the size of the female die. Apply the glue, draw out to proper sticky condition, and place on the second piece of strawboard previously glued to the platen. Start the press, and pull 25 or 30 impressions. Then trim the blotting close to the part of the die that is to be embossed. The closer this piece is trimmed, the greater impression will be obtained from the counter. After the trimming, let the press run for another 25 or 30 impressions, and the counter is ready to run if the stock to be embossed is a medium weight paper. If the impression is not sufficient for proceeding with the job another piece of blotter may be glued to the counter and closely trimmed as previously explained. Blotting counters are softest and naturally do not stand up satisfactorily for long runs. For short runs they are very satisfactory when properly made.

The fundamental principle of all embossing counters is to have the minimum amount of shrinkable material in the foundation. A counter is only as good and as hard as its foundation. If the foundation shrinks, the entire counter requires building up. For this reason it is best to use the one large sheet of strawboard for holding the guides, and the second sheet of strawboard for holding the counter proper. Then any additional material glued to the top of the second piece is used for the embossing force or counter itself because it is being forced into the female die and is itself the male die. This male die should be sufficiently high to reach to the bottom of the female die. No excess impression should be permitted. The depth of the female die determines the amount of force required to emboss the sheets. Any excessive force will only be detrimental to the counter and will not give any better results in the finished product. When embossing is frequently done, it is best to have a steel or brass plate attached to the platen with screws. This will eliminate the strawboard as a sheet of paper may be glued on this steel or brass plate for holding the guides. This plate will make a firm foundation.

Strawboard Counters

Strawboard counters are more durable than the blotter counter, because the material is harder than the blotting. Strawboard counters are made exactly the same as the blotting counter. Sometimes substitution of hot glue in place of cold glue tends

to make a more durable counter. Ground glue may be purchased in a paint store and heated on an electric or gas stove. It is best to use the double boiler principle because it keeps the glue from burning. A small ink can placed in a larger ink can with enough water to keep it from burning will do the trick for small users. An electric glue pot is suggested for those who would make sufficient use of it.

Kraft Paper Counters

Kraft paper and hot glue counters are also very durable and easily made. The foundation is made as in the two previous explanations. When the foundation is sufficiently high, a medium weight kraft paper is glued to the strawboard in sufficient quantities to permit of a satisfactory counter. These counters must be allowed to stand at least thirty minutes before they are ready for use. The hot glue and kraft paper fill in the deep parts of the female die and when the counter is dry it is ready to run. When the counter becomes weak, another application of hot glue and kraft paper is applied.

Silicate of Soda Counters

Silicate of soda (liquid glass) counters are more durable than those previously mentioned, because the liquid glass—which may be purchased in any drug store—becomes very hard and brittle. These counters are made in exactly the same way as the kraft and hot glue counters, except that the liquid glass is substituted for the hot glue. The kraft paper is used with the liquid glass and about 25 impressions are given each sheet of kraft that is applied to the counter. The finished counter must stand about one-half hour, after which time it will be ready for use.

Automatic Felt Blanket Counters

Automatic repressed blanket counters are made in the same manner explained for the blotting and strawboard counters. This blanket is similar to the newspaper blanket—in fact, it is made by the same company—although it is especially treated for embossing. The cost of this blanket is very small, and it can be purchased by the square foot.

Shellac Embossing Counter

The shellac counter is one of the most versatile counters used today. It is made by building up the foundation with two sheets of strawboard, then applying the sheets of warm shellac which makes the male portion of the counter. The dry shellac may be

purchased by the pound in a paint store, and comes in thin small pieces. These pieces are dumped into a pan which is placed on a stove and kept hot. The shellac becomes one mass in the hot water and is then lifted out, rolled flat with a large, smooth bottle on a flat surface table. After rolling flat the shellac is placed back in the hot water, and when again pliable and hot, it is placed on the foundation of the counter on the press after which a few impressions are hurriedly taken. The counter, when trimmed closely, is ready for use. After the guides are placed, the job is ready to run. One good feature of this counter is that when it shows signs of weakness it may be reheated with the aid of a blow torch applied directly to the top of the counter, and again brought up to satisfactory embossing conditions.

Compound Embossing Counters

Compounds of various kinds are very successfully used in the building of embossing counters. Some of the compounds are patented, and may be purchased from supply houses. Some home-made compounds are satisfactorily made with plaster of paris and paste and fire clay and silicate of soda.

Plaster of Paris Counters

Plaster of Paris and paste make a satisfactory compound which resembles putty. The plaster of Paris must be mixed with the paste (such as Arabol)—not the paste with plaster of Paris. If the mixture is made as directed, the putty will stay soft for a longer period than if the reverse combination is followed. This condition permits of a better working product, and will dry in sufficient time to proceed with the job. After the putty is ready, it is applied to the second sheet of strawboard on the platen, and a sheet of folio is placed over the putty, after which an impression is taken, and the surplus composition trimmed off the counter. 25 or 30 impressions are then pulled on the counter. This counter requires but a few minutes to dry, after which the job is ready to run. A thin application of oil applied to the female die with an oiled rag will keep the composition from adhering to the female die.

Fire Clay and Silicate of Soda Counter

Fire clay and silicate of soda (liquid glass) make a simple and durable counter. Fire clay may be purchased at a stove supply store, the silicate of soda in the drug store. The fire clay is mixed with the silicate of soda to a consistency of putty. The putty

mixture is spread over the strawboard on the platen, a piece of folio is placed over the putty, a few impressions are pulled and the surplus putty is trimmed off the counter, after which about 25 impressions are pulled, and the job is ready to run.

To Remedy Cracking

When the sheets being embossed show signs of cracking or bursting at the top, it is necessary to do one of three things. The simplest is to sandpaper the male die to eliminate the trouble. In sandpapering take a fine piece of sandpaper of about 00 quality, place it under a small block of wood, and run the block over the face of the male die. This will tend to even the pressure of the sandpapering, a thing which is difficult to control when working it by hand with an uneven piece of sandpaper.

Another method of overcoming this cracking is to glue a sheet of folio or tinfoil over the female die, with the glued side toward the female die, then pull an impression which will make the sheet of folio or foil stick into the engraved part of the female die. This will make the die more shallow and thereby eliminate the cracking. Third, the use of a hot-plate bed which keeps the die warm, will eliminate cracking or bursting. These electrically heated beds, upon which the female die may be fastened, can be secured from supply houses, and can be had in almost any size.

Any embossing, whether it is done on an upright embosser, platen or cylinder press, can use the eight kinds of embossing counters explained herein.

Embossing a job one-up is rather a simple proposition, but when the job is more than one-up, the problem is more complex, because of the registration. When an embossing job is to be put on a cylinder press, the form is registered to the sheet to be embossed. The packing is then taken off the cylinder and the strawboards are glued directly to the bed. The foundation of the counters is applied the same as for the platen press, and the counters are finished with one of the light embossing methods explained above. Of course, the gripper edge of the cylinder must be kept under normal conditions as to gripper and register requirements.

Some cylinder presses have a steel plate which is screwed onto the bed of the press to take the place of the strawboard foundation for the counters. These steel plates are successful when they hug the cylinder, but if there is any play between them and the

bed of the press, the constant vibration of the counter every time the press goes over the impression will ruin the counter.

Embossing On Cylinder Presses.

Another difficulty that some printers experience when they try to emboss a job on a cylinder press is with register, especially when the job has several rows of plates which are placed behind one another. This difficulty can be overcome if the operations performed are considered in minute detail. The brush and bands must receive attention so as not to press the sheet into the valleys formed by the rows of counters on the cylinder and thereby push the job out of register. When the job is registered the packing on the press is of a uniform thickness around the cylinder. The distance between the rows of plates is controlled by the periphery of the cylinder and the number of packing sheets on the cylinder. When we take this packing off the press and substitute the male die counters instead, we are shortening the distance between the rows of plates because the packing is not as thick between the counters as it originally was when the form was being registered. This distance between the rows must be controlled in order to maintain register. This can be done by pasting strips of cards between the rows of counters. In that way the sheets will be drawn up to their regular position and into register.

The difficulty in correcting misregistration in embossing work when there are many plates in the form arises from the fact that no individual plate-shifts into register can be made without affecting the counter. The shellac counter previously described provides for such a move, because if a plate were moved one lead the counter could be heated with a blow torch and pulled again and in this way made to conform to the necessary requirements. Strawboard counters can be wet and repulled, but this operation is not always conducive to satisfactory results.

An ideal embossing compound is one that will be sufficiently hard to stand up under pressure and will also be sufficiently pliable to permit of softening for moves into registration. This happy combination would be the panacea for the embossing industry.

Chapter XXII

Hot-plate Embossing and Paneling

Blind embossing and paneling can be done on the printer's press equipment. Some printing establishments handle considerable of this work. When the methods of production are understood, the operations can be done economically.

Before the technique of each process is discussed it may be well to consider the types of presses best fitted for this kind of work. Paneling has no limitations so far as presses for production purposes are concerned. Platen, automatic and jobber or cylinder presses may be used for the job. But, blind embossing or hot-plate embossing cannot be placed in the same category as paneling with reference to press requirements. Tremendous pressure is required in this operation and although it is possible to do a job of this nature on the universal type of platen press it is not advisable to use this kind of press continuously. The tremendous pressure put on each impression has a telling effect on the press itself with the ultimate result of a breakdown if the runs are long or frequent. Presses built for printing should not be expected to do this heavy work. The "cutter and creaser" type of universal platen press, or upright embossing machines, are best fitted for this work.

The limitations of the universal type of platen press for plate embossing put the size of the hot-plate at about 3x5 inches and the runs at a few thousand. If the requirements for a job are larger, or if you would be compelled to use the press often for the operation, it is best to farm the work out to an embosser who has the larger and heavier equipment. There may not be any immediate or apparent wear and tear on a press as a result of this hot-plate embossing, but the damage is being done and the breakdown finally and disastrously arrives.

When a hot-plate embossing job is of small size and run on the universal press, proceed with the job as follows.

Secure a heating unit to fit the chase for the press to be used. These units are heated by electricity and are somewhat similar to the patent bases used for letterpress printing. The height of this unit must allow for the brass plate or die to come to the

required "type-high" of .918 of an inch. Embossing plates are generally made to .375 of an inch and the patent base letterpress printing plates are made 11 points or .152 of an inch thick. Check up these factors of plate and base thickness to insure satisfactory results.

Brass Plate for Die

Next get a flat brass plate or die one-half inch larger in both dimensions than the size desired for the hot-plate panel. Mark off the exact size desired for the hot-plate panel on the face of the brass plate. Center this size on the face of the brass and then send the brass plate to a machine shop and have the machinist cut the brass plate on a milling machine to the exact size as marked on the face and to a depth of about one-sixteenth of an inch in the brass. The finished brass plate will then be machined to the exact size desired for hot-plate embossing and will be trimmed one-sixteenth of an inch below the embossing surface on all four sides of the brass plate. The trimming is very important because this shoulder protects the sheet and eliminates buckles in the sheets to be embossed, a condition which cannot be controlled when the brass plate is the exact size of the embossing panel desired. When brass plates stored on hand are the exact size and cannot be trimmed as suggested, it is advisable to build up this shoulder on all four sides of the plate by fastening either wood furniture or metal plates to the base. The result is not so good as that secured in the first method, but it will often overcome the difficulty of buckles occurring during production.

Fasten the brass plate or die to the base which contains the heating unit. The unit is then locked in the chase and placed in the press. Take off the tympan and wash the bed of the press with a mild solution of lye or tri-sodium phosphate to remove all traces of grease. Then glue a sheet of pressboard or fibreboard to the bed of the press. Cold glue may be used in this operation but it should be applied generously to the sheet of pressboard and then worked into a stringy condition by placing the hand in the glue and drawing it away from the fibre or pressboard. The action must be done quick at first and slowed up toward the end. Increase the distance between the hand and the pressboard until the glue turns into myriads of strings. The glue when in this condition is at the height of its adhesive powers and should immediately be placed against the object to which it is

to be fastened. The minimum amount of glue and maximum adhesive quality make for a perfect job. Many jobs of this nature have failed because the glue was applied in too generous a quantity and not worked into a stringy condition to bring out its adhesive qualities.

After the pressboard is glued to the bed of the press an impression is taken and test made for the amount of impression required to give satisfactory results. When antique paper is to be printed with halftone plates the paper itself must naturally be as smooth as possible. If the job is of this nature sufficient impression is applied to the pressboard to insure the die getting down into the rough paper to smooth out the rough irregularities of the stock and permit of satisfactory printing of halftones.

When the sufficient amount of impression is secured the guides, straps and fenders are fastened to the pressboard, which was previously glued to the bed of the press, and when an O.K. for position is secured the job is ready to run. Register on a job of this nature is, naturally, important and constant checkups to insure register should be made while the job is running. Variation in margins caused by careless feeding will be noticeable in the panel.

Procedure In Paneling

Paneling, of course, does not require as much impression as does hot-plate embossing. Neither does it require a heating unit as described for the hot-plate job. Paneling also, as was previously explained, can be done on any type of press. It is necessary to have a male and female die in order to get the desired results in paneling, but this male and female die can be manufactured in any printshop from materials on hand. The only difference between the dies for paneling and those used for embossing, is that the force which acted as the male die was fastened or glued to the bed of the press and the female die was locked in the form. This position of the dies embossed the stock so that the raised part of the embossing was above the face of the paper. In paneling the male and female die will act in the reverse way in that the male die, which will be locked in the chase, will be brought against the female die, which will be fastened to the press bed and the paneling will be below the surface of

the sheet, which is the reverse condition from the usual result of embossing.

The simplest method of paneling stock for a platen press job is to secure a block of box-wood, which is cut and planed to type-high (.918 of an inch). The block should be about two inches larger in both dimensions than the size of the panel desired. Next secure a sheet of three-ply vellum stock, which is very tough. Measure and draw the size and shape of the panel on this sheet of three-ply vellum. Next glue the sheet of three-ply vellum to the box-wood block, by applying the glue only to that part of the vellum stock directly beneath the rule size of the panel which, of course, is glued to the block with the panel dimension side up. Lock the block into a chase and clear the bed of the press as previously explained for hot-plate embossing and also glue a sheet of fibreboard or strawboard to the bed of the press to which must be fastened the guides and fenders. Next cut along the lines drawn on the vellum sheet which has been glued to the box-wood block. This must be done with a very sharp knife. Cut deep enough to go through the vellum, yet not too deep so as to permit the vellum to fall away from the block. Apply glue to the frame of vellum stock which has been created by cutting along the pencil line. Work this glue into a stringy condition, and pull an impression against the strawboard or fibreboard that has been glued to the bed of the press. Permit the press to stand on the impression for a minute or two and then open the press slowly. The frame of vellum should now adhere to the bed of the press and the inside of the vellum sheet should adhere to the block. This must be in perfect register. The block in this sense acts as the male die and the frame as the female die, as previously explained. For paper stock no clearance is required at the edges between this frame and the male die. Extreme caution must be used to see that the register of the press is perfect so that the male die strikes the exact position when it forces the sheet into the female die which is fastened to the bed of the press. After the guides and fenders are satisfactorily applied to the press and after the position is approved, the job is ready to run.

It is also important to remember that no scratches, glue or other foreign matter can be tolerated on the plates in this proc-

ess. Especially if the scratches or foreign matter appear on the box-wood block or on the vellum frame. The most minute scratch or cut in the vellum block will show on the paper being paneled. Very satisfactory results can be secured in paneling almost any kind of paper stock if precautions regarding register and cleanliness are observed.

A brass die as previously described under hot-plate embossing may also be used in paneling. Of course, the female die must be cut to exact register and the usual precautions for cleanliness and register must be observed. Some printers are using metal base plates such as those used by electrotypers or stereotypers. These must be cast and planed to the proper type-high measurement. It is necessary when using metal bases of the type metal variety to cover the entire face of the plate with a tough paper stock to prevent the plate from smudging or marking the stock. The female die must be cut to exact register in this case also, and the usual register and cleanliness is required.

It is possible when cutting the female die to use strips of tough check or vellum stock which must be glued to the pressboard or tympan to the exact position as indicated by an inked impression of the metal plate to be used for the male die in the paneling. The strips of tough check or vellum must be glued right up close to the edge of the impression made by the male die. If there is any space allowed between these strips and the die the paneling will be less effective, as the panel itself will be rounded and dull instead of pointed and sharp.

The method of press preparation for paneling is the same for platen, cylinder or automatic job presses. The principle of making the panel is exactly the same, but greater care is required on the cylinder style press in getting the female die in position and greater caution is required to keep the job in register. If all factors are considered paneling can be done successfully on any type of press.

Chapter XXIII

Gum Label and Embossed Seal Printing

The directions for the process of printing, embossing and die cutting in one operation will cover this work as done on platen presses of the Universal style. Maximum impression is needed for the work. That is why the Universal is mentioned. The regular Gordon press will not give satisfaction because of the lighter impression. C. & P. heavy duty platen presses, however, may be considered. The Universal impression can be increased or decreased according to necessity, by a simple movement of the attachment for impression control.

There are special upright label printing presses made for this work but it can also be done on the equipment that any printer has in his pressroom. The specially made press for label work does the same thing that we are about to describe here. It prints from a small form of plates on a roll of paper stock and delivers the job on an endless rubber belt. There are some label presses that will print two colors and emboss and die-cut at the same time.

One Color Labels

One color labels can be printed, embossed and die-cut at one and the same operation. The color of the paper is an adjunct in this process and two-color combinations are thus always possible. The work is of the highest quality. It is used for labels and seals or any small job that demands minute detail and brightness of color as well as the embellishment which comes with a well-embossed job.

The all important factor in this work is the die. It must be cut to contain the detail demanded in embossing, furnish the printing surface of the plate and include the cutting edge for the die-cutting.

The die is an engravers product. It is cut in the same manner as the ordinary embossing die. The material is generally one-quarter inch cold rolled steel which is polished on one side. This polished side is the printing surface. The lettering and the ornamental designs are engraved below the surface and in this way

act as an intaglio method for producing the embossing. All dies must be engraved with an outside border around the design, and the edge of this border is then represented in a groove outside the border. This produces an embossed border. The cutting edge is then made by cutting away all the steel beyond and outside of this outer edge of the rule, representing the outside of the embossed border. This outside rule border on the edge of the embossed border is then cut down to the thickness of a one-point rule with a sharp cutting edge bevelled away from the cutting rule and the design on the die. The finished edge on the cutting die is one-half point. This is done to facilitate the die-cutting part of the job, and at the same time protect the printing design and the embossing design in the plate. The finished die thus has all the functions incorporated in itself that would belong to a printing plate, an embossing plate, and a die-cutting form, if the same job were to be produced by a letterpress printer in the ordinary way.

Each of these separate functions must be well performed in order to insure satisfaction in the finished product. The smooth polished surface acts as the printing plate and must be free from scratches and blemishes. The embossing die must contain the minute detail demanded by the job. The embossing counter must act both as the embossing counter and as the printing surface or packing for the printing part of the job. The die-cutting part must perform the duty of die-cutting and at the same time it must keep the plate free from dirt and cut-offs and the embossing die free from fill-ups. The die-cutting edge must also be free from smudge which may mar the appearance of the finished job. This work on seals and small labels is naturally of small form size. It must be of small size because of the tremendous pressure required to do all three operations in one impression. Dies are not mounted for printing purposes. The printer must mount them. The one-quarter inch cold-rolled steel plate on which the die is engraved must be mounted on a base which is then locked up in a chase for production purposes. A steel block about six inches square and about five-eighths of an inch thick is best for this purpose.

It is not always possible to secure a base and block that will meet the printer's height requirements of .918 of an inch. The next best thing is to get the base and the die as near to type-high as possible. Then put the balance of thickness behind the form. The steel block five-eighths of an inch thick is equal to .625 of an inch. The quarter-inch cold-rolled die is one-quarter of an inch thick and equal to .250 of an inch. The kraft paper used for gluing the two plates together is about .010 of an inch thick. The total thickness would then be .625 plus .250 plus .010 which totals .885 of an inch. It is best to use a micrometer for this checkup. This is .033 of an inch less than the .918 required for type-high. The difference can be made up by inserting the .033 behind the die by using a sheet of tin or other hard substance of proper thickness.

In gluing the die to the base be sure both surfaces to be glued together are clean and free from oil. Put a few scratches in the back of the die to insure a greater chance of its remaining securely glued to the base. First glue a piece of kraft paper to the base block, then glue the die to the kraft paper. This will be more secure than if the two steel surfaces were glued together without the kraft paper as the binder. In applying the glue (which may be cold, such as LePage's) put it on in an even thin film and then work it with the fingers so as to cause the glue to become stringy. Place the fingers in the glue and draw them away from the sheet or steel plate until the glue becomes myriads of silken strings or threads of glue. This is very important. Glue will not hold unless it is at its highest point of viscosity and ready to stick the two pieces together immediately. Air cannot reach the glue after it is covered with the plate, hence it will not dry. If it does not dry it cannot hold.

If the base and the die are not securely glued together the pressure applied to the die will cause the die to move and put the embossing counter out of register with the die, thus ruining the work and necessitating a fresh start. Lock the steel base into a chase, before the die is glued to the base in order to insure its being securely fastened. The chase is placed in the press immediately after the die is glued to it.

The six-inch square base should be locked in the exact center of the chase. Prepare the glued die and base, then place the die in the exact center of the base. Place the chase in the press and pull an impression in order to give the glued plates as much pressure as possible. The bed of the press should have a steel plate fastened by four screws—one in each corner—on which is built the embossing counter and printing surface for the job. It is possible to do this kind of work without this steel bedplate if the counter is built up directly on the bed of the press. It is best to have a bedplate for all presses that are used for em-

bossing or die-cutting. The change over from printing to embossing or die-cutting can thus be done with minimum effort.

The make-ready is done in a manner somewhat similar to any make-ready method for embossing jobs with the slight differences occasioned by the special requirements for this type of work. After the bedplate is clean and free from grease and is attached to the press a sheet of kraft paper is glued to the bedplate. This sheet is a little larger than the die to be printed and embossed. Use the same method of gluing as was explained for the gluing of the die to the base. On top of this kraft glue a sheet of No. 50 strawboard. Make a light impression with the die and build up all the weak spots in the die impression. Thin gum kraft paper is used for patching up. When all the weak spots have been patched, glue one sheet of kraft paper over the entire embossing counter and make another impression. The impression control lugs on Universals are always used to good advantage for this purpose, being set back to the last lug when the job is started and moved up as impression is required. Examine this next impression carefully to ascertain whether all of the details are showing satisfactorily. Next glue a piece of No. 70 strawboard over the top of the impression and make another impression. Then glue a piece of kraft paper over the counter and let the press run for about twenty or thirty impressions. This running of the press will form a solid counter and tend to bring out all the details contained in the die. All the material in the counter outside of the cutting dies is cut away. This leaves the cutting edge free for doing the cutting on each impression. This cutting away of the counter material is done in such way as to give the counter every protection. The cutting is done on a slanting line away from the counter.

Running the Gum Seal Job

The job is now ready to be run. Note that no mention has been made of any ink in the preparation of the job. No ink is used until the job is ready to run. The ink rollers and fountain setting are the last operation performed in the process. Everything is controlled by the embossing requirements of the job. The fact that the surface of the die is used for the printing part of the plate leaves all necessary attention for this part until last. Printing details are assured. Brayer rollers are not necessary as would be the case if the job had to be registered into the printed part of the sheet if there were more than one up.

The next operation is the setting of the guides, which in this case consist of long reglets of pica size for a bottom guide and a rather large fender to be used for the side guide. There is no solid side guide for this kind of work because the jobs are run from strips of stock about five labels up and the sheet is slid along the pica bottom guides until the five impressions are pulled on each sheet before the sheet is taken from the press. The length of the reglets is determined by the size of the sheet to be used for the job, as well as the size of the die being used.

If, for example, the die was 1½ inches square, the paper could be cut 8½x1¾ inches which would allow five impressions or labels from the sheet. For this job, glue one pica reglet about four inches long ⅛ inch below the counter and center it on both sides of the die. Next place a sheet of the stock on the guide in the position for the first impression which should be pulled on the extreme left hand side of the strip of stock. Next glue another three-inch piece of pica reglet for the bottom guide starting from the right hand end of the stock and running toward the counter. Next place the strip of stock so the extreme right hand side is being printed, this will be the position of the sheet when the last impression is being pulled. Place a three-inch pica reglet along the bottom of the strip beginning at the extreme left hand end of the strip and extending toward the counter. This will allow about two inches space between the reglets on each side of the four-inch piece. The grippers are set to fall in these spaces. Fenders are placed along the sheet and one fender is to be placed as near and to the left hand side of the counter as possible; this fender acts as a side guide in that it guides the feeder where to place the sheet for the next impression on the strip. It does not stop the sheet in any way—it merely guides the distance of the movement of the strip in order to get five impressions on the sheet. Five impressions are to be made on each sheet before it is removed from the press.

Function of the Blanket

The trick of this whole process is the fact that each impression is pulled with the sheet placed upon a rubberized cloth blanket measuring about .018 of an inch thick. This blanket acts as the foundation of the impression and allows the cutting edge of the die to force the paper apart without cutting anything but the paper itself. The resiliency of the rubber permits the sheet to be embossed and printed and acts as the rebuff for

the needs of the cutting parts of the die. About 12 or 15 pieces of rubber blanket are cut to the same size as the strip of stock to be used for the job. The strips of stock are placed on the strips of rubber blanket by a girl who keeps the feeder supplied with the stock for the press and at the same time takes the finished sheets from the press and removes the waste paper from the labels.

A small hinged cover should be placed over the counter to protect it while the press is running and to provide for placing additional patches on the counter if necessary. It should be scored and this score should make a flap to provide for lifting to place patches on the counter. The cover must be made of pressboard about .015 thick. The corners should be rounded to prevent catching sheets being fed. The hinge should be glued down to the right-hand side of the counter so as not to interfere with sheets being fed. The pressboard extends about half an inch beyond both side edges of the counter. This pressboard will protect the counter as well as allow for putting on patches.

After all this work is done, and not until then, the rollers are placed in the press. The proper color is secured and the job is ready to run. The job is fed with the assistance of a girl as previously explained and the press can produce about 4,000 to 5,000 impressions per day. A long fiber stock is always best for work of this nature, and good quality inks are imperative as the ink is put through severe tests in order to get proper satisfaction in both color and drying qualities. If the label stock (usually gummed) sticks to the hands or the blanket in damp weather a small application of talc powder to the cloth or hands will eliminate the trouble.

Chapter XXIV

Die-Cutting Methods

There are two kinds of die-cutting, the high die and the steel rule. Both methods of die-cutting are explained here. Cutting and creasing for folding boxes comes under the steel rule heading, but will be discussed later.

The construction of a die-cut job determines whether or not it can be done by the high die method. Jobs that have only one die-cut edge can be cut with facility by the high die method. The edge to be cut may be round, square or irregular. If the job contains a die-cut or score rule within the outer edges of the finished piece, it must be done by the steel rule method because high dies cannot die-cut or score inside the outer edges of the finished job. The reason for this is obvious. The high die method cuts or dies out 300 to 500 sheets each time that the machine comes down on the die which is placed in position on the top sheet of the pile to be die-cut. High die-cut jobs should always be sent to a finisher who specializes in this kind of work.

Get O. K. From Die Cutter

It is advisable to get an O.K. for position from the die cutter before attempting to proceed with the printing of a high die-cut job especially if the job is to be run more than one up. This is necessary to protect the job from cracking and bursting when the pressure is applied to the high die during the cutting operation. High dies are made with the bevel on the outside of the cutting edge and this bevel forces its way through the sheets while cutting out the desired portion. The force exerted by the bevel bursts its way through the sheet and is apt to tear the other printed part of the sheet if the printed parts are printed too close together.

There are many die-cut jobs that come into the printer's establishment that can be handled on the universal or heavy duty platen press or the cylinder press if need be. Perforating rule and die-cut forms have been run on Kelly presses. Care must be used in preparation and running of such forms on automatic presses.

The press most frequently used for die cutting jobs in the printer's pressroom, no doubt, is the Universal or heavy duty platen.

Great care and minute perfection must be emphasized if satisfactory results are to be obtained. There are many jobs that require die-cutting on one or two corners or edges of the sheet. If the sheets are sufficiently small to permit of die-cutting on a heavy duty or universal press the job can be produced with the following materials: Die; steel plate bed; some strips of tinfoil and some glue—together with the ordinary tools required for printing.

The die may be purchased from a die maker or if it is a simple job it may be made by the handy pressman generally found in every printing establishment. Steel creasing rule varies in height from .900 to .906 of an inch. Steel cutting rule is .923 of an inch high. Creasing and cutting rule is made both hard and soft. The soft rule is used where it is desired to bend it without breaking and the hard steel rule in places where no bending is required. The hard rule will, naturally, stay sharp longer than the soft rule.

Simple straight rule dies may be made up with the regulation metal furniture and necessary quads. Dies requiring curved rules may be made by first cutting the desired shape with the aid of a make-ready knife and a piece of chipboard. After the shape and dimensions are correct the shape is traced on a piece of cherry block or laminated wood. The design is then sawed in the block with a jig or band saw. The rule is bent to the desired shape on a rule-bending machine. After this is done the job is corked by gluing strips of cork or shoddy rubber on the block along the cutting rules. It is wise to place the glue on the cork or rubber and cut the rubber or cork with the rule and press it down to the block. In this way the cork or rubber will be close to the rule and will prevent the sheet from sticking to the form or die.

No Extra Impression for Die-Cutting

The die is locked into the chase and placed in the press. The steel plate for the bed of the press should be attached to the bed by four screws, one at each corner. This plate can easily be removed when the press is again to be used for a printing job. A sheet of manila paper should be glued to the steel plate to hold the guides.

After the bed adjustment has been moved away from the form as far as possible an impression is pulled on a white sheet. And right here the success or failure of the enterprise will be determined, for if one extra sheet of impression is used in this make-ready of the cutting form the rules will bend and ruin the cutting edge.

The impression is slowly brought up to the form until a slight impression can be seen on the white sheet. When the impression can be seen on the manila sheet which is glued on the bed, cut this manila sheet away from the steel plate along the cutting rule. The cutting must be done against the steel plate, not the manila sheet. Permit the contact of the cutting rule to cut one individual sheet at a time. The form should be underlaid with tinfoil or thin sheets of tin under those rules that require additional impression. After the form is leveled up from the back pull another white sheet and make-ready with a spot-up sheet using fifty-pound super stock for patch up and place the spot-up sheet underneath the steel plate which is fastened to the bed of the press. This sheet may be placed in position by measuring the distance between the cutting rule and edge of the steel plate. Strips of paper should be glued to the overlay and permitted to project outside the edges thereby acting as a guide to the proper position. The screws on the corner of the plate are loosened and the overlay is slipped underneath the plate and in proper position gauged by the extended strips from two sides of the underlay.

After the form is made ready to cut only ONE sheet at a time (and do it without ragged edges) the guides should be placed in proper position and the job is then ready to run. Remember the success of this enterprise depends upon the pressure applied to the steel rules. No excessive impression is permitted. That is why the job is made ready to cut only one sheet at a time. If the one sheet cuts clean on all edges the job may be run to cut several sheets at one impression. But the job will not stand up if the form is made ready to cut several sheets at one impression from the very beginning.

Stripping Cut-off Paper

If the job permits of trimming at a later time the die-cut section may be permitted to adhere to the sheet which will eliminate some difficulty in taking die-cut sheets from the press. If the die-cut crosses the entire sheet, the form should be locked

in the press to permit of taking both pieces of the die-cut job out at the same time. When no other satisfactory provision can be made for taking these cut-offs out of the press it may be necessary to nick the cutting rules in some inconspicuous place so the cut-offs will adhere to the sheet while being taken from the press. These cut-offs are later stripped from the job and leave little trace of the nick in the rule.

After the job gets running and contents of form permit it, it is possible to die-cut eight to ten sheets of 60-basis book at one impression. At this rate of production it is possible to die-cut 30M. to 50M. sheets per 8-hour day.

For automatic Kelly and cylinder presses the materials and procedure in make-ready are similar to those used on the heavy duty platen and universal press. The steel plate must be curved to fit the cylinder of the press and bent at the gripper to hold in position with clamps. The back edge of the steel plate is wired to the reels to hold it in position. This feature makes it difficult to place the overlay in under the steel plate. To overcome this some manufacturers make a turtle with hinges at the gripper.

It is necessary to put the dies in position on a cylinder press before the job can be made ready. While the form is being registered the dies are underlaid with tinfoil or thin strips of tin the same as on the heavy duty platen or universal press.

Great care must be exercised in securing the proper amount of impression just as explained for the job press. Die-cut jobs are difficult to deliver on a cylinder press and it is therefore necessary to nick the rules to permit of delivery.

Die-cut jobs are generally run on heavy stock. One sheet at a time is run through the press instead of several sheets as previously explained. It makes no difference if the job is of thick or thin stock the one-sheet-at-a-time requirement holds for cylinder presses.

Press Perforation, Slitting and Scoring

Several satisfactory perforating attachments for cylinder and job cylinder presses are on the market at the present time. These seem to give satisfactory results when the perforations in the sheet run around the cylinder. The most successful perforating attachments for cylinder style presses are those that perforate the sheet while the sheet is held by the grippers. This type of mechanism gives less difficulty than the type that perforates the sheet after the grippers have released it.

Some types of perforators require a sheet of thin steel as a base for the cutting knife. This steel is fastened around the cylinder and acts as the foundation for the perforation or slitting operations.

When press perforations run across the cylinder it is advisable to place as the foundation a thin sheet of tin in the packing. This is done by gluing both sides of the tin and placing it under the top sheet so that the tin adheres to the top sheet and the second sheet in the packing. This tends to give greater strength to the tin foundation and if the proper amount of impression is placed on the perforating rule the tin will hold the top sheet firmly and prevent it from cutting through and tearing on the stripper fingers. Single perforating rule running across the cylinder will work with greater facility when ordinary adhesive tape is placed over the perforation impression on the top sheet. The adhesive tape holds the top sheet from tearing and helps the perforating rule do a better job.

Chapter xxv

Ink

Ink is one of the most important items of expense in the cost of producing a job. This item is elusive because of the many ways in which ink consumption is affected. Then, too, the printer may become responsible for the fugitiveness or the "lack of color-fastness" of ink. The salient points in controlling consumption could be classified as follows: 1. Amount required; 2. Color desired; 3. Condition of rollers; 4. Difficulty in drying; 5. Spoilage through offset; 6. Need for double rolling; 7. Superimposition of colors; 8. Nature of form; 9. Size of form; 10. Kind of paper; 11. Size of press; 12. Length of run.

Covering capacity of the ink itself must be considered. If ink were sold or measured in volume instead of in weight, difference in consumption of various colors per square inch or per hundred square inches would not be as great as it is at the present time.

Coverage of Opaque Inks

Heavy pigment inks provide less quantity or volume per pound than do the light pigment inks. Compare the pigment lamp black which may form 25 per cent of black ink with colored mineral pigment, which may form 65 per cent of a cover ink. This condition explains the present great variation in ink consumption between different colors. Opaque inks are generally required for cover stock and their heavy pigment provides the smallest volume of ink per pound. Translucent inks, transparent or lake colors, as they are known in the trade, generally use a lighter base, such as alumina hydrate, which allows a greater volume of ink per pound. It is advantageous to use a transparent ink whenever possible in order to save on the amount of ink required to print a color form. A lake ink often possesses a more brilliant shade than a full strength opaque color.

Specific gravity or volume of inks is more important to the printer than the pound factor in purchasing. The reason for the variation in prices per pound in black inks is easily discernible in the comparison of the specific gravity of the inks. The covering capacity in printing ink is dependent rather on volume than

on weight so that if we could purchase ink with reference to volume or specific gravity as well as to weight we would be in a better position to judge the value of our purchases. According to statistics a white cover ink will require 65 per cent more ink than black to cover a given area.

Amount of Ink Required

The amount of ink required for any job represents a cash outlay by the printer. If the amount needed costs $50.00 on an estimated requirement of say, $25.00, it means the printer must pay the added expense without a chance of recovering it. Provided, of course, that he does not know of this added expense until after the job is finished or is not familiar with any method of reducing ink requirements while the job is being printed.

The ideal ink condition on every press is to have the impression on the sheet remove all the ink from the form on every printing cycle. This would keep the form clean and print the job with the minimum amount of ink. When a job is run full color the ink consumption is at its peak. Every extra tooth on the fountain means added and sometimes unnecessary consumption of ink.

The printer sometimes uses an added quantity of ink because a full quantity of ink is needed in order to match the desired color. It is a great deal better for the job—and more economical for the house–to have the color of the ink made a trifle stronger in order to match the color and then run less quantity.

Photo-engravers are, at times, the cause of the use of unnecessary amount of ink on the job. This is because they may double roll a proof which the customer O.K.'s for color. The printer then finds it impossible to match the color with a single roll. Flooding forms to match colors is one of the most expensive methods of printing a job and should not be tolerated. Strengthen the color and run the minimum amount required for the job. This will help solve other problems of production.

Effect of Rollers

Condition of rollers is reflected in consumption of ink. Old rollers, hard rollers, lifeless rollers, all require more ink to get a uniform color on the form and sheet. A greater film of ink is necessary when printing with a set of uneven rollers. The last roller to leave the form before it prints should be the best roller in the set as this roller evens the ink before the form is printed.

Old rollers which contain cracks in the surface cannot be run on a light color job after once having been used for black ink. The ink which has gotten into the cracks will constantly affect the color of such ink by making it dirty or darker as the run progresses. Ink and time are saved by furnishing the pressroom with good rollers.

Difficulty in drying has caused considerable losses to the industry and always will, until we find a way of having the ink maker meet our ink requirements in accordance with the demands made by the paper being used for the job. Paper is secured first. This puts ink in a secondary position, which means that it must be made to meet the demands of the paper.

The most unfortunate thing about slow drying is the fact that the real condition is not known until the next day which often makes it impossible to remedy the trouble on the printed sheets.

Every pressroom should be equipped with a variety of dryers to meet all conditions. Some good dryers are: Paste dryer, Siccatine dryer, Demar dryer, Japan dryer or boiled linseed oil. They should be used sparingly until understood. These dryers, except the paste dryer, will tend to thin the ink and may affect the running conditions. All these things must be taken into consideration at the time of putting them into the ink.

Spoilage through offset may be caused by the condition of the ink, the amount of ink on the sheet, the atmospheric condition of the pressroom or various other factors. One certainty about offset is that a quick setting ink of ordinary quantity will not offset unless because of static electricity or unduly rough handling. There are many good anti-offset compounds on the market, all of which tend to accelerate the setting of the ink. Intelligent use of any of these compounds will tend to eliminate loss of profit through offset. Spray guns are being used with success in eliminating offset.

Double Rolling

Double rolling a form will sometimes save ink and money as compared with an attempt to run full color and one impression, a method which does not always work out economically or satisfactorily. Heavy forms requiring two impressions need 60 per cent more ink than is necessary for one printing. Double rolling the form takes 20 per cent more ink than is required for single roll. Double rolling a job then, is more economical than the double impression so far as ink consumption is concerned.

Superimposition of colors, that is, printing of one color over another, takes less ink for each succeeding color. It is best to use transparent or lake colors for this imposing of colors. Lake colors permit of printing dark colors or key plates first, and lighter colors last. Four-color process work on two-color presses is handled today in such a way as to permit of printing the key plates first and following with the other colors regardless of what they may be. Light colors are even being run on the second cylinders of two-color presses and yet they do not pick up the darker preceding color because the body of the second color is softened so it will lay on the first printed wet color without picking it up and "dirtying" the light color ink.

The nature of the form will have a bearing on the quantity of ink required. The United Typothetae of America shows seven kinds of forms in its method of estimating ink consumption. These are: 1. Very open light forms; 2. Book work; 3. Catalogs with illustrations; 4. Heavy plates and type; 5. Reverse plates; 6. Solid plates. 7. Four-color process work. Starting with .102 lb. for 100 square inches on rough stock in Class 1 there is an increase for each succeeding class over its preceding class: Class 2, .153 lb.; Class 3, .254 lb.; Class 4, .381 lb.; Class 5, .763 lb.; Class 6, 1.27 lbs. This condition shows how easily a printer may slip up on his proper classifications and pay the penalty of an unexpected increase in ink consumption. See Ink Estimating Schedule (page 143).

Size of Form

Size of form is very important and the form should really be measured for area. Actual area estimated for the proper kind of form and stock will enable the printer to save the ink that he would waste by estimating a lower quantity than will be required.

The nature of the paper is the most important factor in consumption of ink. Hard smooth papers take less ink than do rough soft papers. This difference is so great that in four classes of paper, namely, rough, M. F., S. & S. C., and coated, the increased consumption for each succeeding class reading from the coated to the rough, on a Class 1 form is: Coated, .047 lb.; S. & S. C., .052 lb.; M. F., .074 lb.; Rough, .102 lb. for 100 square inches of form surface per 1,000 impressions.

Right Press Saves Ink

The size of press has a great bearing on the amount of ink that will be consumed on the job because the covering capacity

of a large press is greater than the small presses. When a form covers more than 75 per cent of the bed area of a cylinder style press and 50 per cent of a platen and is of the solid variety, there is apt to be trouble in running the job. The packing may pull out or creep up on the cylinder press, and there may be difficulty with the covering capacity of the rollers as well as with the delivery of the job on the platen press. It is best to put the job on a larger press when the form is solid and covers more than 75 per cent on cylinder style and 50 per cent on platens.

Length of run always affects the average amount of ink consumed per thousand impressions. On long runs the consumption can be checked and rectified if incorrect. Reducing the ink is a great help in saving the printer's profits on a job that is consuming more ink than required. Making the color deeper is another way of overcoming the condition.

All inks should be reduced with care. The best reducer any pressman can use is a softer ink than the one he is using. This is particularly true of the black inks. When colored inks are being run and need reducing we find 00 varnish–boiled linseed oil, citronella, castor oil, kerosene oil, balsam of capaiba, turpentine, and many patented reducers on the market that will answer the purpose. Dryers must sometimes be added when non-drying reducers are used, especially on the hard surface papers.

Solid Jobs

When solid jobs are being run on rough finish papers such as M. F. book, the ink may be reduced down to a "soupy" state in order to conserve the quantity used and yet maintain a satisfactory covering capacity. We have known of a saving of 200 pounds on a 450 pound total actual consumption of a colored ink on this stock effected after 50 pounds had been run on the job and could not be salvaged.

The need for care in ink consumption is not an idle dream when we recall that some jobs of medium size sheets 33x44, printed in solid orange, will consume fifteen pounds per thousand impressions. Think of the ink bill on a 50,000 run.

Ink Estimating Schedule

All pressmen should know the amount of ink the various kinds of forms will consume. Here is the ink schedule as contained in the Standard Book on Estimating for Printers (1936) as written by

Fred W. Hoch and published by the United Typothetae of America. It is self explanatory.

INK

Amount of Black Per 1000 Impressions

Class of Form	Kind of Stock	Per 100 Sq. In. of Form Surface
1 Very Open Light Forms	Rough	.102
	M. F.	.074
	S. & S. C.	.052
	Coated	.047
2 Book Work Open Display	Rough	.153
	M. F.	.111
	S. & S. C.	.078
	Coated	.070
3 Catalog with Illustrations	Rough	.254
	M. F.	.186
	S. & S. C.	.130
	Coated	.117
4 Heavy Plates and Type	Rough	.381
	M. F.	.278
	S. & S. C.	.196
	Coated	.175
5 Reverse Plates	Rough	.763
	M. F.	.557
	S. & S. C.	.392
	Coated	.350
6 Solid Plates	Rough	1.272
	M. F.	.928
	S. & S. C.	.653
	Coated	.584
*FOUR COLOR 7 Process Work	S. & S. C.	1.25
	Coated	.75

Additional for Colored Ink

Blue	15%
Red	25%
Brown	25%
Green	25%
Yellow	45%
White	65%
Duotone, Blue-Black	10%
Duotone, all others	15%
Silver	100%
Gold	125%
Double Roll	20%
Double Impression	60%

Stocks

Rough—Soft cover, antique book, blotter, eggshell book, soft bogus bristol, and similar stocks.

M. F. Book—Sulphite Bond, hard cover stock, and similar stocks.

S. & S. C.—S. & S. C. book, rag bond, Manila tag, pasted bristol, high-grade M. F. and similar.

Coated—All coated book, blank bristol, label, etc., either polished or dull.

Method of Using Foregoing Tables

*Four color process work section shows the total amount of ink required for the four colors The rates of each color to the total is approximately: Black 20%, Blue 25%, Red 25%, Yellow 30%. Hence if 16 lbs. are required the individual amounts would be Black 3.2 lbs., Red 4 lbs., Blue 4 lbs., Yellow 4.8 lbs.

Factors to be determined:

1. Number of square inches type-page area per page.
2. Determine number of pages of each class—light to solid.
3. Classification of paper—rough to coated.
4. Number of impressions, or books.

In the table locate the amount of ink for each thousand impressions according to class of form and class of paper. Multiply this figure by the number of pages of this class of form. If the job contains several classes of pages, figure each class as described, add the results and multiply by the number of thousands to be printed. This will give the amount of ink used if printed in black. If printed in color add the proper percentage for color used as shown in schedule for colored inks.

Chapter XXVI

Color Mixing and Matching

The simpler the process, the more successful will be the result. Mixing colors is no exception to this rule. The printer who knows the fundamental principles of color mixing will be able to get desired results provided he has the proper materials with which to work.

English vermilion and the artificial ultramarines will attack copper plates because of the sulphur contained in the dry color. Sulphur, when used on copper plates, becomes copper sulphate and this chemical action changes the surface of the plate. Copper plates must be nickel-plated or washed with a solution of cyanide of potassium and nitrate of silver for inks containing sulphur. Nickel is impervious to sulphur.

A well-known publisher a few months ago made an analysis with a set of original four-color process plates which had been used for printing a job. The printer claimed that the copper used on these plates was of inferior quality because the red form caused considerable trouble and showed a considerable wear all over the entire surface of this one plate during the run. The engraver claimed that the printer did not make the job ready properly and the wear in the plate was caused by the printer's carelessness. The engraver had been making plates for this publisher many years and never had had any difficulty before. The printer always printed from four sets of plates, three of which were lead mould nickel face electrotypes and one set of copper face originals. A laboratory test showed no imperfections in the copper used for the original plates. A test for "type-hi" showed proper height. A further test under a glass revealed the fact that the top of the halftone dot in the intermediate shades showed evidence of roughness. This is the reverse from a worn condition caused by improper or excessive impression, because wears of this nature are always smooth from the burnishing effect of the pressure applied. Upon these findings a report was written attributing the fault of the wear to the use of a sulphur-content red ink. This finding was correct. Nobody had thought of asking the ink man for his opinion. He would have recommended nickel plating or a change in the basic content of the ink.

One other important checkup point at which the printer should watch the ink maker's selection of dry color used in the manufacture of the ink is when the customer demands permanency of color. The printer is not a chemist in this respect and to protect himself he should make the demand for color permanency on the ink maker. Most ink makers will not guarantee their inks for permanency of color because of the possibility of the printer using a reducer or a dryer which may turn the ink from a permanent color to a fugitive one.

All Process Colors "Cold"

Aside from these two points it is not necessary for the printer to know the nature of the dry color in order to get his desired shade or tint. If there are no demands for color permanency it makes no difference if the colors used are natural or artificial mineral pigments. He should, however, know that warm colors mixed together will give a warm result in the mixed color. Colors are known as warm or cold according to the amount of their red content which, of course, determines their warmth. Blue reds, those showing a tendency toward blue instead of orange, are cold reds; yellows showing a tendency toward green are cold yellows; blues turning toward red are warm blues. Colors which tend toward the light are warm, those which turn toward darkness are cold. All process inks are of the cold variety, the yellow is of greenish tone, the red of bluish tone and the blue is of a greenish tone.

In 1666 Newton discovered the spectrum of seven colors into which the sunlight is broken when intercepted with a prism of glass: Violet, indigo, blue, green, yellow, orange and red. Scientific instruments of today break up these seven colors of the spectrum into more than one hundred and fifty hues. Pigment colors in printing inks are merely light reflected from a surface. When all the light is reflected we call the article "white"; when all the light is absorbed we call the effect "black." Between the two extremes, "white" and "black," any portion of the rays composing white light may be reflected while the other rays are absorbed. It is this infinite number of ways in which light may be reconcentrated by absorption of a part and reflection of the remainder of the rays that gives us our world of color. Primary colors of the spectrum are generally agreed to be orange-red, blue-green and violet. Primary means those colors which cannot be made by a mixture of any other colors. In the spec-

trum then, the three primary colors just mentioned are the fundamental colors in white light that in varying proportions will make all the other colors in the spectrum.

Spectrum and Pigment Colors

Primary pigment colors differ from the primary colors in the spectrum because we consider yellow, red, and blue the primary colors for pigments and not the orange-red, blue-green, and violet, previously mentioned for the spectrum. The reason for this is that a pure neutral yellow cannot be made from any mixture of pigments, although it can be made by orange-red and blue-green lights. The blue and yellow pigments make green, and the blue and yellow lights make a gray-white. Hence, our primary pigments—yellow, red and blue—are not true primary colors as far as light is concerned, but they are the primary colors of our ink color mixing system. For this reason you have often heard a printer who handles pigment colors say that black and white are not considered colors. The colors are produced by the mixing of the colors themselves and the black is used for a shading medium and the white for a tinting medium.

In our method of mixing ink we shall consider color or hue, the shade, and the tint. By adding black to any base color it becomes a shade and by adding the base color to white it becomes a tint. The Munsell Color System, originated by A. H. Munsell of Boston in 1900, describes color in terms of Hue (the color), Value (amount of light reflected by a given color), and Chroma (the intensity of color). The Munsell Color System is very comprehensive and any printer interested in the subject of color should consult this system of color measurement.

Complementary colors are those opposite each other on a color chart showing the primary, secondary and tertiary colors such as the chart shown herewith. (See illustration 22.)

Complementary colors harmonize with each other. They may be found by analyzing the three primary colors. Green is a mixture of yellow and blue color and lacks red entirely; hence, red is a complementary color to green. Colors that contrast are complementary to each other.

The basis for mixing all pigment colors are the primary colors —yellow, red, and blue; the secondary colors—orange, purple and green; and the tertiary colors—citron, russet-brown and olive-green. The secondary colors are made from a mixture of equal parts of the primary colors. Yellow and red make orange,

red and blue make purple and blue and yellow make green. The tertiary colors are made by mixing equal parts of the secondary colors; the orange and green make citron; the green and purple

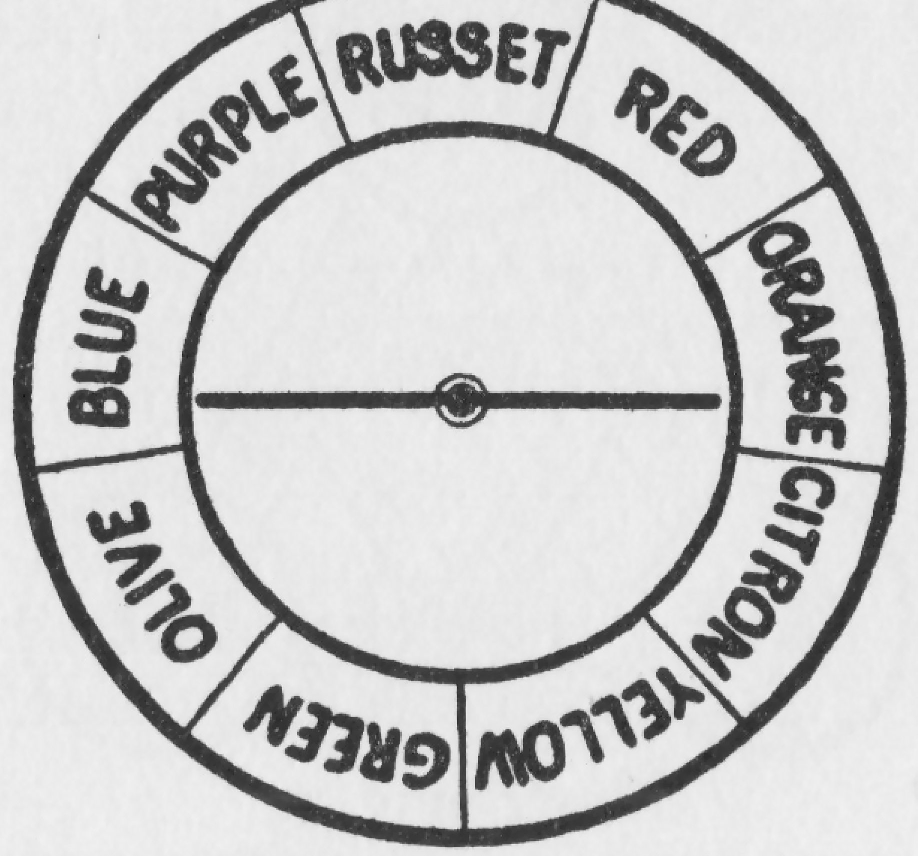


Illustration 22

The accompanying chart shows the pigment primary, secondary and tertiary color in one continuous band. The complementary colors are opposite each other. They may easily be found at the ends of a line drawn through the center as indicated. True complementary colors are free from any part of the color contained in the complement. Any mixture of two primary colors is always complementary to the remaining primary color

make olive-green; and the purple and orange make russet-brown. A touch of black ink added to these colors will make the colors a shade colder and a touch of these colors in white ink will make a tint which will be warmer. It must be remembered that all colors cannot be matched from the three primaries as some colors have a brighter base color than can be acquired from a mixture. Persian orange and vermilion red, for instance, are made from special dry colors and not matched from the yellow and red contained in primary colors. (See illustration 23.)

One very good rule to follow is always to add the dark ink to the light ink and do it very sparingly. If the light ink is added to the dark ink there may be considerable ink wastage in matching the color. Blues that lean toward the red make the best combination with warm color mixtures. When a secondary color is wanted, say an orange, it is necessary to take the two primary colors (red and yellow) to get the orange. When an olive-green (a tertiary color) is wanted the two secondary colors (purple and green) should be used. It is true

that the olive-green is made from the yellow, red and blue primary colors, but it is more simple to make a two-color mixture rather than a three-color mixture whenever possible.

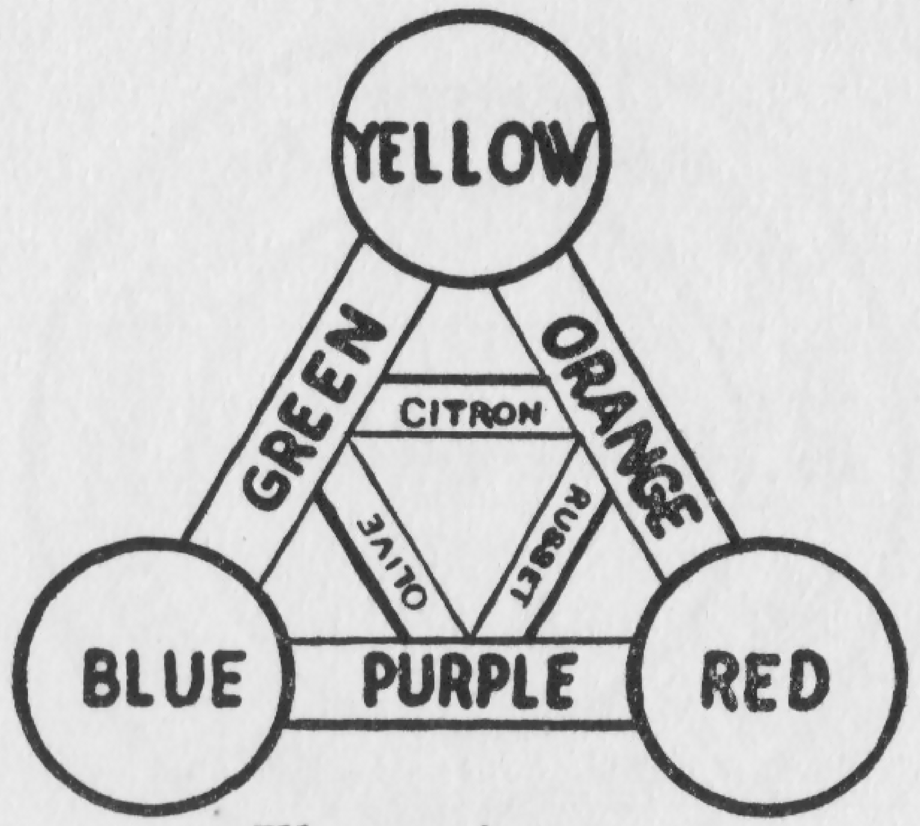


Illustration 23

The three primary colors, yellow, red and blue will make the secondary and tertiary colors as shown in the chart. The secondary colors, green, orange and purple are shown as bands connected with the primary colors. The tertiary colors, citron, russet and olive green are shown as bands connecting the colors which are mixed in order to get the colors as designated

When mixing subdued colors or shades by two color mixtures, it becomes necessary to add black or dark colors to the base color. When mixing tints by two-color mixtures it is necessary to add the base color to the white. (Note that the darker ink is always added to the lighter ink—this insures economy in mixing the proper quantity required). The following table for two-color mixtures should help in getting the proper results.

Base Color	*Added to White Makes*	*Adding Black Makes*
Red	Pink	Maroon
Orange	Buff	Brown
Orange-red	Salmon	Yellowish-Brown
Orange-yellow	Cream	Russet
Cold Yellow	Straw	Citron
Green	Pea Green	Sage
Blue Green	Sea Green	Myrtle
Blue	Azure	Navy-Blue
Violet	Lavender	Slate
Purple	Heliotrope	Plum
Blue-black	Cold Gray	
Brown-black	Warm Gray	

There are times when a dark ink other than black may be used for subduing colors. This condition is determined by the requirements of the problem. Violet, for instance, will deepen yellow and not turn it green as a blue-black is very apt to do.

Tools for Mixing Ink

The first requisite for mixing ink is a clean slab, such as marble, litho stone or plate glass. Any surface that may easily be kept perfectly clean is suitable for the purpose. Cleanliness is the most important factor in mixing colors. A scale is needed for weighing the portions of ink for the mixture. This is very important when an ink needs to be matched in several batches for a long run job as the formula should be kept for subsequent mixings. Palette knives are also needed, two large and one small, and a small palette knife ground off at the handle to be used for drawing out colors. (See illustration 24.)

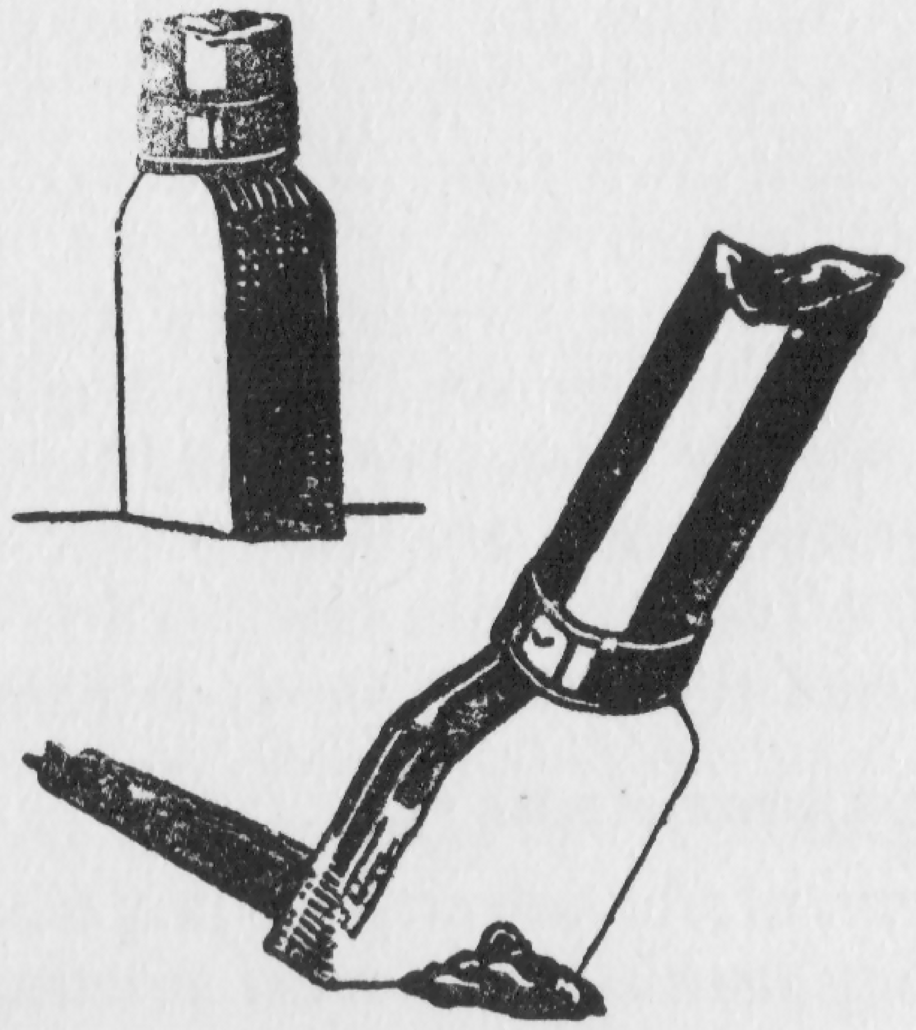


Illustration 24

A thin film of ink can be drawn out on the paper with the aid of a small sharp-cornered color drawing ink knife. The sides of this special color drawing ink knife must be at sharp right angles with the end and the corners must be ground exactly square

A pad of clean white book stock is useful. It is always best, however, to do the final matching of the color of the ink on the paper stock to be used for the job.

Mix the ink to the desired color, shade or tint. Test the ink by taking a small amount on the color drawing knife, and drawing it across the sheet thereby rubbing the ink into a thin film.

Cut this film of ink through the center of the strip, then lay the strip on top of the color to be matched for a comparison. Another favorite method is to tap out the newly mixed ink with the finger, or a piece of paper held over the finger. This tapping and drawing out method of matching a color checks up on the undertone of the ink. On jobs of color matching, where the second batch of ink is to be matched with the first batch there is a possibility of matching the overtone of the ink by placing a small batch of the newly mixed ink on the extreme end of the ink knife and then dipping this end of the knife in the batch of ink to be matched. This method provides a very close checkup on the color of the ink because the two batches are laid side by side on the knife to be compared. If the overtone is matched in color the undertone should also match. This is not always true, however, and it is best to check the color both for an undertone and an overtone color comparison.

Those printers who have the ink manufacturer close at hand should use the ink man's laboratory for the matching of colors and thereby save their own time and money. Printers who are not advantageously located will, it is hoped, find the contents of these chapters helpful in meeting their future color requirements. And even the printer who has and uses all the facilities of his ink manufacturer's laboratory should know the fundamental principles of mixing color because he may want to match a color for a small job from the inks contained in his ink closet.

Keep oil sheets and tight covers on your cans of ink!

Superimposing Color–Inks

The constant cry of the advertising profession for more and better color printing has made the relief printing industry realize the necessity of knowing all there is to know about methods of handling colors. Some color jobs have open forms where an added color does not require any register. Such jobs are simple to produce, but when the job requires register as well as the printing of one color on top of another production difficulties increase with the number of colors required.

When colors are not superimposed (printed on top of each other), but printed directly upon the stock it is only necessary to choose the ink with reference to the paper. Each color of ink should be matched separately. Inks of the proper kind are made to suit the paper and to print directly upon the paper stock. When the job requires that one color be printed over another

the situation changes. The ink printed upon the sheet in the first impression must be kept in a condition that will permit of taking the ink on following impressions. Also, of course, the color-matching problem must be kept in mind when colors are superimposed especially when rigid demands are made as to color of the finished product.

Right Kind of Paper for Ink

Printing ink of the general variety requires a paper surface that will permit the ink deposited by the form to print smoothly and dry by either absorption, oxidation or both. The best surface for this purpose is found in the soft, absorbent book papers.

Modern advertising requires all kinds of fancy and hard paper stocks. These papers require special treatment for the ink when color is being printed upon them since the ink must be adjusted to the peculiar conditions of the paper stock. If the stock is of hard finish the ink must be of sufficiently stiff body to permit of printing evenly and without a mottled effect. This is particularly true if the job is to be printed on a platen press. After the ink is put on this hard-finished sheet it must dry within the regular number of hours. From four to eight hours should find the job in condition to handle without smudging.

For some jobs the ink must set more quickly than this or there may be trouble with offset on the job. Recent developments in ink are directed toward quick drying. Hard surfaces do not permit of much absorption and inks for such surfaces should be made to dry by oxidation as well as by absorption. It is possible at times to make inks lay smoothly by the intelligent use of various compounds sold for the purpose of eliminating offset. These compounds will sometimes help to print the job without a mottle. Care must be exercised when adding them to the ink in order to insure a satisfactory job.

The difficulty encountered when too much reducer of any kind is used is that the color rubs off after the job is supposed to be dry. The reason for this in most cases is that, in reducing the ink to make it print, the binder which generally is represented by the drier is weakened and, instead of binding the ink to the paper while it is drying, allows it to dry on top of the paper with the result that it can be rubbed off. The dry color leaves the binder or vehicle in which it is ground and the vehicle soaks into the sheet of stock. The dry color thus becomes a free agent, and cannot be bound again without another impression

of ink as a binder. This seldom can be accomplished because of the risk of spoiling the job by causing it to be rubbed while being handled.

For the same reason it is very difficult to print over a hard or crystallized ink. The surface is not susceptible to the second color because it is too hard and does not possess the absorbing qualities required to print satisfactorily. Paraffin oil is generally used to mix in the ink to meet this condition. Paraffin oil produces a condition in the two inks that helps both films attract each other. Ink makers have an "ether compound" which they recommend for this purpose.

Doctoring Ink

There are times when an ink can be doctored with some home-made treatment to run satisfactorily without mottle or offset. All treatments cannot be used successfully in all cases. Especially when the job in question contains halftone plates. Most treatments to eliminate mottle consists of mixing some kind of powdered material into the ink to kill the grease. This cannot be done satisfactorily without the aid of an ink mill to thoroughly grind the material into the ink. When powders are mixed into inks used for halftone jobs they naturally cause fill-ups which in some cases are more expensive to eliminate than the mottle condition experienced before the mixing of the ink. Again there are times when the use of a small quantity of precipitated chalk, corn starch or powdered magnesia will help the ink on a solid job to lay more smoothly and without a mottle—especially when being printed on a platen press. It not only permits the ink to lay smoothly but gives it a velvety appearance as well. It causes the ink to set quickly and thus helps to prevent offset. One experience remembered quite clearly involved the mixing of ink for a rotogravure job to be printed in four colors. The base of these inks was precipitate of chalk and Demar varnish together with the other ingredients and the result was a liquid content, free-flowing ink. When the prints were completed they possessed the soft effects contained in pastel drawings together with the mat, velvety effects secured on water-color jobs.

Select Proper Ink for Paper

Quick-setting inks are needed in many cases and every printer should be careful in making a selection from his ink closet when the job has superimposed color or when it contains halftones. Ink is very often a small item in the cost of the job, the average is

about three per cent, yet it has frequently been the sole cause of reprinting an otherwise satisfactory job. If the ink must be doctored, have it done by someone who understands how to do it and then test the printed results to learn the effect of the reducer or doctor which has been mixed in the ink.

Sequence of Colors On Process Work

The sequence of color used in the production of process work is generally dependent upon the engraver's proof—that is, the progressive proof furnished with the plates. This is the best guide to follow in printing a process job. There are times when the engraver will change the sequence of his colors, and when this is done the progressive proof will show such change. For instance, if yellow, red and blue are run in such sequence, the progressive proof will show yellow proofs, red proofs, yellow and red, then blue, and then yellow, red and blue.

The sequence of colors used by the photo-engraver is partly governed by the kind of ink used in producing the job. When transparent inks are used, the sequence of color may be changed around to satisfy the condition. When opaque colors are used, it is best to print the light colors first and the dark colors in their proper sequence, up to the black. Some printers prefer to produce process work in the sequence of yellow, red, black and blue, in this way getting a sheen on the blue form when the job is completed.

If there are no progressive proofs available for the job, it may be advisable to run off a set of proofs on a job press as a guide in producing the job to the customer's satisfaction. In this way the customer can O.K. the job press proofs, and these proofs may be followed as a guide by the pressman.

Superimposing Wet Colors

Ink superimposed while wet, as on a two-color, three-color or four-color press, involves ink difficulties. Many problems are encountered in planning production for these jobs. The nature of the form, together with the kind and color of paper stock to be used and the kind of ink required are only a few of the problems.

The superimposing of wet inks affects the color values of the two inks being used. The consistency of the inks themselves will control the color value of the finished job. The wet inks of a red and blue job could be made to print either red-blue, blue-red or purple. Each ink must have a thinner body or consistency than the ink that it prints upon. When this condition

exists the finished color will be in accordance with the plan or color scheme of the job. When the second color is stiffer in consistency than the first color, the effect will favor the second. The second will retain its own hue because the stiff body will keep the ink from laying on the first color which will be offering a greasy surface for the second color impression. Tack will not print on grease. When the first color is stiffer than the second color, the tacky first impression offers a susceptible surface for the softer second color. The second color will then lay upon the first color in a smooth surface and will blend with the first ink to give the desired result.

There is difficulty at times on a two-color press in trying to match a color that has been printed one color at a time on the proof press. Colors that are superimposed on dry impressions do not give the same result as when superimposed on wet colors. Some of the wet ink blends with the second color and changes the result accordingly. Four-color wet superimposed jobs should be proved in wet colors.

Varnishes are made in about fourteen different body consistencies. These range from the body gum No. 9, which is the heaviest, to the No. ooooo (5 oh) which is the thinnest. Reducers range from boiled linseed oil through all kinds of liquids, including castor, citronella and kerosene oil. When inks are to be superimposed in a wet condition it is necessary, as has been noted, to have the second color a little softer or thinner than the first color and for this reason it is necessary to use a thinner varnish for reducing the second color than is used for reducing the first color. It is necessary to reduce the first color at times in order to get it to work properly and when this must be done it is necessary to reduce the second color with a thinner reducer.

It should be remembered that in reducing an ink the drying qualities are being impaired. For this reason it is well to use either a drying reducer such as boiled linseed oil or to use a small amount of liquid or paste drier to offset the effect of the non-drying reducer. If ink consistencies are not satisfactory it is possible to remedy them by using good judgment in applying the reducer. It is best to tell your ink man just what you intend to use the ink for.

The proper sequence of printing the process colors is the regular, yellow, red, blue and black. This sequence is sometimes changed to allow for specifications contained in the job. At times the blue and black are reversed if the subjects permit in

order to maintain a sheen. One of the difficulties of wet printing is the partial elimination of this sheen which is often desirable in the four-color process work produced on single-color presses one color at a time.

There was a time when all light colors were run first in superimposing wet colors and the darkers colors followed in the order in which they became stronger and darker. The reason for this precaution was to overcome the darkening or "dirtying" of the light colors when the light colors were printed on top of the wet dark colors. The consistency of the second color would permit the ink to pick up a small amount of the dark color at each impression. This dark ink would be deposited on the inking mechanism of the light color and in time darken the second ink to such an extent as to necessitate a wash-up in order to eliminate the trouble.

With proper ink consistency the necessity for wash-up is overcome. When the second color is of thinner body than the first color the second color does not have sufficient tack to pick up the first ink and thus it can deposit its film of ink on the impression without picking up the dark color which precedes it. Modern production therefore can disregard the sequence of color prescribed by the pioneers of process printing and can adjust to the peculiar demands of the job.

Register is a very important factor in color work, especially the four-color process work. For this reason the two forms that offer the most intricate register are run together in order to overcome the "off register" so easily noticed in process work. If the red and blue forms offer the greatest obstacle in register and if one of them is the key form it is always best to run them together. In this way no time will be lost in lining up the form and the job will be kept in register with a minimum of effort. There have been cases where the sequence ran yellow and black and then red and blue. Other color sequences have the blue and black together and the red and yellow second.

Color Sequence Important

It is difficult to run jobs in this manner, especially if the engravers' proofs supplied for color guidance, have been run in a different sequence. This guidance is lost when the sequence is changed around and great care must be exercised in setting the color in order to match the engravers' proofs furnished. Engravers' proofs should really be pulled in the sequence to be

used in printing the job. If it is possible, however, to get the entire four colors made ready at one time on two two-color presses it will afford an opportunity to ascertain if the color values are correct as shown in the engravers' proofs, which may have been run in different sequence, and to pull and mark color proofs for future guidance. Sometimes it is possible to run the colors close together, that is, one press could follow the other press after about a four-hour run and in this way the entire run could be watched for registration and color with a minimum chance for "slip-ups" on the job. It is not always possible to run so close together especially with those automatic feeders which smudge the sheets while running.

Tackiness of ink will also affect the register of the job. If the sheet is held firmly by the grippers through the entire printing cycle there is not much chance of having trouble with register from this cause. If the sheet is not held by the grippers throughout the printing cycle, but depends upon a set of reels to hold it, there is apt to be trouble with the register caused by tacky ink. Such ink can easily pull the sheet through the reels and out of position and register.

Transparent Inks

When the sequence of ink is changed and the light colors are run after the dark colors it is necessary to use transparent, or rather translucent inks in order to permit the first printed colors to blend with other colors. Opaque inks are seldom used in superimposition of process colors unless they are used on the first color printed.

Color matching is difficult in the printing of wet colors. Proper shades of ink are necessary in order to get the proper color results. The overtone and the undertone of some inks are distinctly different. It is best to test inks by drawing them out with an ink knife before using them for matching colors. It is the thin film of ink printed on the sheet that controls color values and not the bulk of ink contained in the can. Spread the ink into a film to know its true color.

Chapter XXVII

Metallic Inks

Recent magazines and trade papers have carried heavy page advertisements with solid gold or silver backgrounds. Many printers are interested in the possibility of producing such jobs with ease. There was a time when metallic ink at best was difficult to run. This fault seems to have been overcome. Advertisers and direct mail printers are using metallic inks with considerable success and satisfaction. This is due to improvements both in the manufacture of the ink and enlightenment in its proper use.

Some ink manufacturers advocate mixing the ink in the fountain as it is to be used—others deliver their product all mixed and ready to run. The ready-mixed inks of a few years back invariably became dull, through oxidation of the metallic powder used in the ink. This was particularly true of the gold inks, which are made from bronze powders. Loss of brilliancy has been overcome to some extent in the inks now offered due to a change in the base vehicle used at present. The former acid content vehicle has been changed to a neutral gum which does not attack the bronze powder and tarnish it as did the acid. Paper also affects powdered bronze. Neutral or slightly alkaline papers have the least tarnishing action. Silver ink does not have the same drawbacks in the way of oxidation and tarnishing as does gold ink because the vehicle does not attack aluminum powder as readily as it does bronze powder.

Superior qualities in the metallic inks of today are due to the high degree of refinement of basic raw materials as well as to the change of the base vehicle. Ink manufacturers are now better able to maintain uniformity of quality to eliminate undesirable ingredients.

Set Rollers Lightly for Metallic Ink

The letterpress printer interested in knowing how metallic inks are handled will find here a brief resumé of important points. The make-ready must always be handled with care for the impression must be as light as possible. It is best to make the job ready in a different color of ink—orange is a good color to use

when the job is to be printed in gold ink. After the job is made ready check the rollers. In fact, it would be even better to check the rollers first to see that they are full of life (suction) and free from cracks. They should be set as lightly as possible, but should be set to provide their utmost in covering capacity.

After the rollers have been properly set and the job carefully made ready, the ink should be placed in the fountain and a minimum amount distributed evenly upon the press rollers. Too much ink on the press when the job is starting up will cause trouble by building ink up on the rollers which may not transfer satisfactorily to the sheet. If this occurs, it is best to wash up the press and start over again. Better have too little ink on the press for the first impression and then let the color run up from the fountain. In this way the correct color can be controlled and maintained. It is important that a full color be run at all times.

Some ink manufacturers deliver these inks ready-mixed. Such inks, naturally, are placed directly in the fountain. When the inks are delivered in powder and varnish form, it is, of course, necessary to use discretion in mixing to insure proper proportions—each part must be carefully weighed or measured in bulk. The powder should be added to the varnish very slowly and the mixture should be stirred well so as to avoid making lumps.

It is necessary for the ink manufacturer to know the kind of paper to be used for the job. This is important so that he may furnish the proper kind of varnish and powder as well as advise the proper amounts of each to use for the paper stock. Some authorities place the proper proportion for coated paper stock at *nine parts of powder to seven parts of varnish for the gold ink, and two parts of varnish to one part of powder for silver ink.*

Wash-ups Desirable

It is possible with present-day metallic inks to run all day without the wash-ups which were so prevalent years ago. It is advisable, however, to wash up at noon hour in order to get a clean form for afternoon production. Wash-ups are not always needed because of the ink. Dirt in the stock or foreign matter gathered by the press while in motion is sometimes responsible for the trouble.

Forms printed in metallic inks are generally of the heavy variety. Although type can be run in combination with these forms, it is not advisable. It is sometimes necessary when using these inks to double roll the job and this may result in loss of legibility for the type forms. It is, however, advisable to double roll such a job rather than spoil it. Sometimes it is necessary to put a base color underneath the metallic ink. This depends upon the porousness of the stock. Smooth finished papers such as glazed, coated, glassine and cellophane work with or without the base. The absorbent papers require a base. Gold ink particles have no undertone or staining qualities as have pigment inks. Because of this the paper will show between the particles of metallic ink. A halftone screen for a base has been suggested by J. Frank Carey, who claims that a solid will absorb too much metallic brilliancy. Mr. Carey, with the Philadelphia office of Fred H. Levey Company, and Arthur Schiefer, of Triangle Ink & Color Company, were "consulting chemists" in the preparation of this information. Special base inks are made for silver and gold inks. They generally are transparent in order to permit the paper to show through at any point that does not register perfectly.

It should be remembered that when metallic inks are mixed in the fountain, only enough ink to be used for the day's run should be mixed. All ink left over in the fountain at night should be thrown away if it loses its brilliancy.

The covering capacity of silver ink is about one-half that of black ink. Gold will require one hundred and twenty-five per cent more ink than will the black. Of course, it is understood that these comparisons are made with identical kinds of paper stock and the same forms. If much special-mixed ink is thrown away each night it is obvious the ink consumed will not be according to these percentages.

All jobs to be printed in black or other color over metallic ink must have a special ink for the purpose—the finished and dry metallic impression is greasy and the ink to be used for overprinting should be made especially for the purpose.

Alchemic Gold Ink

The bookbinding industry has an alchemic gold ink which is used for stamping covers. The process is patented and a Colts press is used—although one is not limited by the nature of the process to this press because the basic principles are the same as for printing any kind of job. It is possible in this process to pull covers of one line stamping and to take the cover immediately after it has been printed and rub it without injuring the impression. The ink dries on the cover immediately—but does not dry on the press. This ink comes ready-mixed and does not

tarnish as the method of manufacture protects the powder with a lacquer coating to insure brilliancy. The pigment vehicle is of low volatility and high viscosity and thus will dry immediately upon being printed with a heated impression. The various vehicles are selected by their boiling points to control the drying qualities.

The plate to be used for the stamping is fastened to an electrically heated patent base locked up in the chase and bed of the press. Special rollers are used—those not affected by the heat thrown off by the base. The volatile oils in the ink dry slowly when they are cold. When the ink is applied to the form which is heated and an impression is pulled on a book casing the heat causes the ink to volatilize immediately and the gum in the ink holds the ink to the surface of the book casing. This process permits the press to run with the minimum number of form rollers and gives a wonderful impression. There are times when jobs of this kind are given two impressions. When this is done the second impression is made immediately after the first one is pulled. In fact, about twenty cases are printed, then transferred over to the feed-board and again fed into the press for the second impression.

Chapter XXVIII

Dimensional Trade Expressions

The printing industry has not kept abreast of other industries in setting standards. These standards should include trade expressions with accepted meanings in the trade. There are several accepted meanings of the same expressions in the various branches of the industry. Take for instance the paper page size of a booklet, the type page size of a circular, and the paper page size of a ruled sheet or blank book. In each case there is a different method of determining the way the type shall run on the circular, which edge shall be the binding edge on the booklet and which way the rules shall run on the ruling job.

Confusion surrounds an oblong and upright single sheet job as well as a pamphlet binding job. Precautions are necessary at all times to secure a proper understanding of what is wanted. The customer may have an entirely different idea of what he is going to get even though he uses the same expressions as the printer, who is to do the job.

The single sheet job presents possibly the greatest difficulties with regard to the use of trade expressions which have no standard meaning and which the customer is likely to misunderstand. Upright and oblong are the terms most frequently misunderstood. To printers the expression 20x35 ems for a type page size really means 20x35 ems of pica, although the qualifying word "pica" is left out and the first mentioned figure is taken as the way the type should run. This job then, for a single sheet job, would be an upright job. If the size were expressed 35x20 picas it would be an oblong job. But how is the customer to know this generally accepted trade custom unless the printer asks him which way the type is to run? To insure protection for both the customer and the printer insist that the word upright or oblong be placed on the specification blank and ask the customer which way the type should run. This double checkup will cover the compositor who will set the job and the customer who will pay for it. It will standardize instructions on this point.

Jobs that come to the printer with the copy generally have this matter indicated, but when copy comes in with instructions

only for a given paper page size there is a hazard for the printer as well as for his customer.

The pamphlet binding industry has similar difficulties in regard to trade expressions for dimensional sizes. A 6x9 sixteen-page booklet might be bound on the 6 or the 9-inch side. The type-page size and the way the type runs on the page is not a factor because the type could run the 6-inch way and the job could be bound at the top which would make it an oblong book so far as the binding was concerned. Care should be taken regarding the binder's part in the job as well as the printer's part. Binding edge should always be indicated. The United Typothetae of America recommends using the size first mentioned as the binding edge of the book. The Standard Book on Estimating for Printers, a U.T.A. publication by Fred W. Hoch, contains a complete statement of this method of determining the binding edges, sizes and shapes of books and booklets. This method which is taught to those who take the U.T.A. course in estimating, constitutes a protection for both the printer and the customer. The size first mentioned is always the binding edge of the book. A 6x9 book would be an oblong book and a 9x6 book would be an upright book with a nine-inch binding edge. As a precaution against error use the words upright and oblong.

Bookbinders Standards

This simple method of expressing sizes and binding edges has not as yet been accepted by all persons in the bookbinding industry although every effort is being made by the Bookbinders Association to standardize dimensional trade expressions.

One-fold jobs that are sent to the binder very often do not contain complete information regarding the final size required for the job. A single sheet job may require two or three folds. The complete information regarding this kind of job should always be given. If a 9x12 job is to be folded three folds the finished size should be given with the instructions, as "folded three folds to size 6x3 inches." A dummy should always be given to show how the printed matter should be arranged for proper folding. Indication for type folded inside or outside is an important feature of such jobs. Issue complete instructions.

Blank Book Industry Standards

The ruling and blank book manufacturing division of our industry has another problem—they must know the way the ruling should run as well as the binding edge of the sheet. This industry has met this difficulty by establishing the rule that "in all blank work, the dimension of the left-hand side of the blank is given first, regardless of the binding edge." Hence the left-hand side of any blank to be ruled is the first size given. A 9x12 blank to be ruled would have the faint lines running across the 12-inch way of the sheet and the 9-inch dimension would represent the side edges of the sheet.

It will be noted that this method of determining the dimensional meaning in ruling is the opposite of the custom used in the composition division of our industry where the first mentioned size represents the way the type should run on the sheet. Here are two trade customs regarding sheet sizes in the same industry and each means a different thing. They should be standardized. Proper standardization works from the inside to the outside and trade terms are no exception to the rule.

For make-ready symbols and patch-up trade expressions see page 224.

Every pressman should know where to find a type character in case of emergency

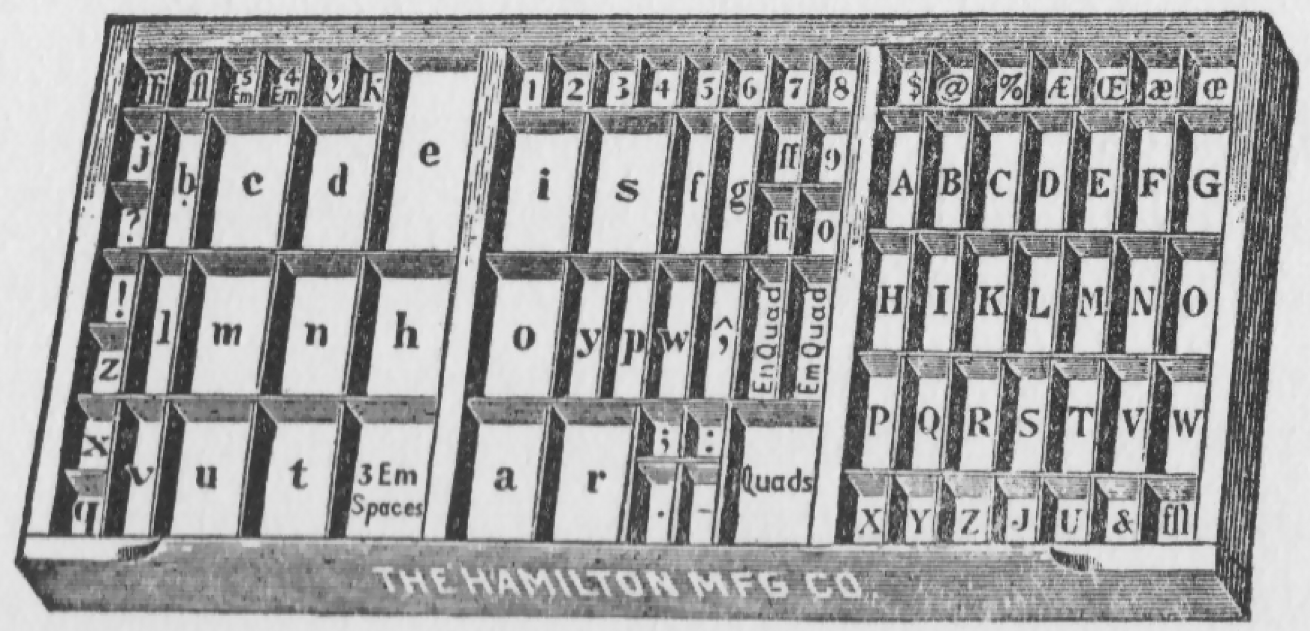


Illustration 25

The above illustration shows distribution of type in a California Job Case

Chapter XXIX

Selecting Pressroom Equipment

The recent trend in the pressroom from the use of slow big presses to fast small presses has caused many printing plant proprietors to pause before deciding what purchase they should make in order to have their pressrooms as complete and up-to-date as possible at the lowest possible cost. It is not always easy to find the solution to this problem. The many sizes of presses on the market with their varying speeds and construction make it difficult to comprehend the real advantage one way or another. Present day methods of selection also take into consideration the standard size sheets offered in paper stocks and the possibility of running these sizes with the minimum amount of cutting and changing of forms.

The answer rests mainly with the kind of work the plant is doing or expects to be doing when the new machinery is in operation. Whether the platen, jobber, cylinder, or rotary type of press is to be installed should be governed by a survey of the jobs that have gone through the plant in the past year or so. Determine how many of these jobs can go on the press under consideration. It is best to set up the cost of operating this new press in the plant, then estimate the cost of these jobs if produced on the new press, and compare this estimated cost with the actual cost of doing the work on the present equipment.

Old-established printing concerns find themselves at times in competition with other firms with newer and faster machinery, very much to the dissatisfaction of their sales departments. Many times differences are due not to the newer machinery of the competitor but to combinations of runs used and the condition of the presses in the older plant. It is possible to have old presses in good working condition and new presses in poor working condition. The condition of equipment depends entirely upon the personnel and the care exercised by the man in charge. This controls the profit on the job as well as the quality of the work and thus sets the prestige of the house. Presses in poor condition generally reflect this condition in the work produced on them.

Proprietors who specialize have an easier time in selecting their presses. Their decision is generally controlled by their experience in the field in which they operate and the production results they have had in past years. The type of work done is most often the factor in deciding the kind of presses to have in the plant.

Some printers today are offering special service to the trade in bronzing. These printers place a limitation on the presswork they can handle because of the kind of presses used in producing the bronze work. On bronze jobs the printer's original guides must be used in order to secure and hold register. The kind of press, whether cylinder, jobber or platen, should correspond with the special requirements in order to get desired results.

Thermographers at the present time are trying to ascertain the most economical press for their purpose. The length of run as well as the kind of work is a factor for them to consider. Most of them now use the automatic platen press, some use the small cylinder type jobber, Style B Kelly, etc. One of their problems has been the processing of the work while the ink is still wet.

Web press and color rotaries present individual problems which must be considered on their own merits. Sometimes the printer is tempted to purchase a special kind of press in order to get a particular contract which requires this kind of work. Such special presses are likely to become white elephants on his hands if he loses the job at the expiration of the contract. Conditions of this kind have played havoc with the printing industry because the special press is thus thrown in the market in an effort to make it fit general printing requirements.

With the present day tendency toward specialization, it seems possible that the printer of tomorrow will have only his pressroom under his own roof. Engravings, electrotypes, rollers, bookbinding and ruling, et cetera, are separate services which may be purchased outside. It is noticed, however, that while specialization may be separating the printer from most of his manufacturing operations, few offers have been made to sell him presswork. He is seldom approached to release his presswork control to an outside agent—a fact which should prove the importance of this department.

Presses and Presswork

What constitutes a good press? Age is not always a factor, for there are presses in operation today more than 25 years

old that are doing a good class of work. As long as a press does not have any worn parts that will interfere with proper production, it is possible to do good work on it. Economy of operation is also to be considered from a managerial point of view. Generally speaking, a good press is one that is free from worn parts and has a sturdy impression—one that will not cause trouble when a solid form of three-quarters its form capacity is run on it.

In the platen press field this capacity percentage is half the form area of the press because of the necessity for a uniform impression and the pressure required for a solid form. The platen press makes the entire impression at one time, placing a severe demand for pressure at the printing cycle of the impression, whereas the cylinder type of press prints only a small strip of the form at a time. While the printing is continuous the demand is not at any one time as great as on platen style presses and this accounts for the difference in form percentages. On an open or light form this matter of form area need not be considered.

It is better to put a solid form on a larger size cylinder press than required rather than to force it on a small press, with the possibility of being compelled to take the form off the press because of difficulty due to limited roller capacity or to the packing requirements. The packing may creep or pull out according to the physical make-up of the form and content of packing.

Perfect register is a prerequisite for all jobs at all times. The press that causes trouble in this respect is a dangerous one to have in the pressroom. There is no telling when a job will have to be run over because of imperfections. Presses should be tested for register requirements. All presses have limitations as to the speed at which they can be run and still maintain register. It is more important that the job be kept in register than to get a greater hourly production from the press. The production will be of little consequence if the register is not acceptable.

Roller coverage of the press is important. The distribution of ink helps to determine the quality of the job. Too much or too little ink has often been the cause of rejection. The covering capacity of the press will make it easier or more difficult to maintain proper color and quality. This is a factor which does not appear in the initial cost, but comes out in the upkeep and thus may not be discovered until the press is purchased and in operation under plant conditions.

Feeding and delivery devices are also important factors as between a good and a mediocre press. The feeder that will operate most steadily with fewest running parts and with closest detectors for misregistration is the feeder that generally performs most satisfactorily at all times. The feeder that can operate with fewest demands upon the size and weight of stock and can be loaded with minimum effort and maximum speed is the one to be selected. The delivery that should give the best results is the one that handles the sheet most effectively without touching it any more than necessary. The delivery that permits the sheet to lie suspended in the air a maximum length of time will help to obviate offset.

The application of common sense in the use of press equipment is to be encouraged at all times and under all conditions. The pressman should know how, when, where and why a press does not function properly. Tests, if they are required, should be made with the aid of a micrometer and a magnifying glass. Nothing should be left to guesswork or the naked eye. The imperfections are often smaller than the eye can perceive and should be checked accordingly. Conditions should be studied, known and understood. It is poor policy, when something goes wrong, to hold the truth till last. Materials should always be tested as well as the press. Oftentimes material causes trouble that appears to be the fault of the press.

Science, which is nothing more than systematized knowledge, should be an aid at all times. Presswork problems should be approached from both the artistic and scientific side for accurate results. The pressroom worker has the knowledge which he should systematize and apply. The pressroom superintendent who insists that his men use the micrometer, type-high gauge and magnifying glass, and who demands that the packing, plates, type, bearers, rollers and delivery be checked up properly at all times, will have less lost time and a better quality product.

Chapter xxx

New Processes Important

There's nothing so permanent as change. Since the beginning of the printing art considerable effort has been expended in the search for substitute processes of reproduction to replace the job printer's effort. Movable type supplanted hand engrossing. Machine-set type has supplanted the hand-set matter in many instances. Steel die stamping and copper-plate printing took a share of the printed product. Photo-engraving left the wood cut engraver so far behind he could not exist. Electrotypes and stereotypes eliminated the necessity of setting the job in duplicate for a job to be run two or more up. Paper ruling and wax-plate engraving substituted for the printed rule forms. Such has been the march of progress in the printing industry, together with remarkable strides in perfecting fast running printing presses.

Where does the printer fit in this fast-moving picture? Photogravure and rotogravure have been perfected to such a degree as to compete in the commercial printer's field. Photo-gelatin has affected relief printing work. Lithography plays an important part by securing a share of many advertising appropriations. No doubt there is room for all these processes of reproduction, but unless they create work for themselves they are actually substituting for the printer's work.

The commercial printer who helps his customer to create advertising literature has been able to control his own situation. The small job printer, however, has been somewhat helpless in the face of the various and constant efforts which are being made to sell the user of printing a machine or process to reproduce his business forms.

Before the perfection of the typewriter the printer was called upon to print many more of the items used by the business man. Since the perfection of the typewriter steady pressure has been exerted to substitute typewritten work for printed jobs. Form printing is considered by many users as expensive. As a made-to-order job form printing has produced in some instances limited printing sales for the commercial printer.

It is fortunate for the printer that most reproduction processes require type setting as a part of the process in order to be substituted effectively for letterpress printing. This condition, however, does not always prevail. Straight reprint jobs can be photographed and reproduced by offset. Line and halftone reproduction as well as type is now a possibility in reprint work when art work or photographs are available.

When a customer is not particular as to whether the finished job will contain typewriter or roman type he can be accommodated by the offset method. The typist plays an important part in this method of reproduction. The original copy is typed and photographed. The finished product may be increased or decreased in size. All imperfections in the copy are increased or decreased according to the size desired in the finished work. Copy must be typed perfectly to insure satisfaction.

The multigraph machine is offered to do a complete printed job. The job may be printed through a silk ribbon as in the facsimile letter or it may be printed with rollers and printer's process ink without the silk ribbon. Jobs of this nature and on this machine are limited in size and quality. The machine is of rotary design. It can also be equipped with roman type faces made by American Type Founders to be used on the segments. This short type has its limitations in that sizes larger than 14 point punch at the edges. This is due to the combination of the curve in the cylinder and the flat type face.

The mimeograph process is capable of handling small run jobs as the silk used for the stencil has limited production possibilities. The copy for mimeographing is typed directly upon a silk stencil which is proofread, corrected and placed on a cylinder and inked from the inside of the cylinder with a slow-drying fluid ink. Absorbent paper stock is generally used, although offset stock is also being used with considerable success. All jobs on hard paper stock must be slip-sheeted to eliminate offset.

"Mimeoscoping" is the term given a mimeograph job when a design is drawn (generally by hand) directly upon the stencil and printed with the type. Color work is also being done in this process. Art work is now done by hand although the photo-engraving processes are being perfected and applied to this process. The progress of the hand process is somewhat limited because the results are dependent upon the artistic ability of the person making the stencil.

The Varityper typewriter (an improved Hammond machine) is helping the mimeograph industry because this machine gives typewriting a greater versatility in that several kinds of type faces may be used on the machine. Each font of type is cast on a half-round plate which is fastened in a few seconds to a cylinder on the typewriter. These fonts carry an assortment of type faces which permit a job to be typed with any combination of two faces. The italic is a very common combination with either Roman or typewriter faces.

Standard typewriters of today run ten or twelve characters to a running inch. The Varityper, as the name implies, runs up to sixteen characters per running inch, permitting closer spacing and more text matter per page. This machine is used for cutting mimeograph stencils.

The Ditto or Hectograph process which is a gelatine duplicating method, is also doing work which at one time fell to the lot of the printer. This method is based on typing the copy through a specially treated ribbon. The finished sheet is transferred to a gelatin base sheet from which the impressions of the job are pulled. About one hundred copies can be made from one transfer. If the transfer is not satisfactory after part of the job is pulled another sheet must be typed and transferred to complete the job. A special ink is now made for the printer to use on his relief printing press so that the customer may type in his blanks in similar inks and transfer the entire record by this process to a copy sheet for reference.

The Planograph process or photo-offset as it is known in the reproduction field is primarily an offset process. The trade name of planograph is used in some sections of the country as a designation for certain types of work. The process of reproduction is explained under the heading of Planograph Processes, of which offset printing is a part.

Chapter XXXI

Printing Facsimile Letters

The printer can produce imitation typewritten letter work printed through silk to look like the original typewritten letter. It can be done without extra cost in most cases. The American Type Founders Company have cut a type face called Ribbon Face Typewriter that carries the screen of the ribbon in the face of the type. This type is used in the letterpress method of production and no silk ribbon is required. This kind of imitation typewritten letter can be produced in the regular way and needs no explanation. In fact the only precaution necessary is the care required in make-ready preparation to preserve delicate impression necessary for the ribbon-face typewriter type. If this is done the remainder of the work will be similar to the ordinary method of letterpress printing.

Typing Copy for Line Engravings

When typewriting copy is to be used for photo-engraving purposes be sure to have the typewritten copy as dark as possible and typed with a black ribbon. Blue ribbon will not photograph as well as black or red ribbon. A good trick to get the blackest possible kind of impression is to use a carbon sheet back of the sheet to be typed, making the carbon face the back of the sheet so that the impression will reproduce the copy from the carbon in reverse on the back of the sheet of copy. This will make the front side of the sheet have a darker appearance. It is also a good idea to have the sheet on which the copy is to be typed as smooth-surfaced as possible—in fact it is best to use a coated sheet for this purpose. This gives the typewriting machine a better chance to print more uniformly than do the rougher surfaces of the various bond papers. It is very difficult to get a smooth line plate from the photo-engraver and everything we can do to help him should be noted in order to improve the quality of the final printing. It is also true that we can get a better line plate when we have it produced on copper. Take care to give the photo-engraver a smooth print of your typed copy and have every character showing up clearly. All the imperfections in the copy will be exaggerated in the finished plate.

The present-day advertiser who uses facsimile letters generally has his letters produced on a multigraph machine. It is possible to run these letters either through silk or with ink without the silk on the multigraph machine. The silk on these machines is made to move each time the impression of the form or the letter is taken and in this way the silk ribbon eventually becomes dry and light in color in the same way that ribbon on a typewriting machine becomes light and worn. There are two ways to overcome this ribbon condition, one is to have the ribbon re-inked and the other is to apply the ink to the ribbon while the form is being multigraphed. This last method is similar to letterpress printing when the form is inked for each impression.

Personalized letters that carry the person's name and address in the salutation must be produced with care since the body of the letter must be the same shade as the salutation. This matching of ribbons is a difficulty that is ever present in the multigraphing or letter shop business. There have been some efforts made to produce the letter in both the body and the salutation at one impression as on the Kier Individualizing Press. Where this has been successfully accomplished the difficulty of matching the color of the salutation and the body of the letter should be overcome.

Some letter specialists produce their letters for their customers on flat bed or platen style presses. The operation is the same as printing the job, except that the press has an attachment for carrying a silk ribbon across the form instead of inking the form direct. The difficulty of color matching is also present in this method although some specialists seem to overcome the trouble through their thorough knowledge of production methods.

Ink Under or Over the Silk

The only difference in producing facsimile letters as explained in the previous paragraph, on the printer's platen press and the platen press of the letter-producing specialists is the fact that the printer has the ribbon between the rollers and the form in order to have the form inked uniformly while the letter specialist has the ribbon supply the amount of ink necessary to print the letter. Then, too, the printer's silk is stationary while the letter specialist's ribbon moves with each impression. There is another way for the printer of printing through the ribbon on the platen press and that is to fasten the silk across the grippers and ink the form between each impression and then print through the ribbon. The only difficulty with this method is that the work is not as sharp as when the silk is inked while stretched across the form.

When a facsimile letter job is not going to be filled-in and personally addressed to each person on the mailing list it is possible to print these letters on a flat bed press through silk and as many up as the press will accommodate. All that is necessary is to get a few yards of china silk at the department store and cut it in pieces measuring two inches larger than the dimensions of the type form of the body of the letter. Place the form in the bed of the press, say an automatic Kelly press of the cylinder type. Make the form ready in the usual manner and adjust the press in readiness to run. Then wash up the press and remove the suction from the rollers with some absorbent powder, such as precipitated chalk, corn starch or talcum powder. Place the roller back in the press and run up record black ink or any color record ink which is suited to the purpose. Set the fountain and get ready to run. Next take the pieces of silk and lay one piece over each letter page in the form. Open the form and insert the silk down into the furniture of the form. Take a lead and force the silk down in an even and cautious manner, and do this on all four sides of each letter page so that the position of the letter will not be affected by the silk. After this is done the form is ready to run, the ink will be supplied to the form through the silk, the impression will be made through the silk and the finished impression or job will have the appearance of a typewritten letter. It may become necessary to take one sheet out of the packing because of the silk across the type pages. Be sure not to use any excessive impression as it will wear out the silk. It is best to arrange to have a two-line piece of furniture next to the type on all pages as it is better to slide the silk down into the furniture than it is to jam it down between the furniture and the type.

Rotary presses are also used for this work. The silk is fastened across the plate by pasting or by sliding in under the plate itself. Of course such work done under these conditions is not acceptable for fill-in and personalizing because of the difficulty encountered in matching the color of the ribbon. There are, however, many jobs that have to be produced in facsimile letter fashion without fill in. Any printer can do the job at small extra cost. The cost of the silk and the record ink is slightly above the regular requirements of any ordinary job. The production time should be normal with the exception of the time it will take to insert the China silk over the type pages.

Chapter XXXII

The Stencil Screen Process

The stencil screen process, known also as the silk screen and paint screen process, has come into new prominence lately because of its economy in the production of short run work. One reason for this is that plates, as we know them, are eliminated in both single and multi-color jobs—an advantage that has often been aimed for but seldom attained in the processes competitive with letterpress.

The original stencil screen process employed only hand-made stencils. Today stencils are being made by photography on sensitized cloth as well as being cut by hand. It is the lower cost of this preparation, as compared with the cost of plates in relief printing, which enables the stencil screen process to compete successfully with other processes on short run work.

In developing most of the processes in use today, the attempt has been made to substitute semi-skilled or unskilled for skilled labor because of the difference in production costs. This is evidenced in the efforts to put printing machines and other reproductive devices into offices and large manufacturing establishments in order to cut down printing costs. Many jobs are today being produced in mimeograph, multigraph, photo-offset and the like which were formerly produced by the printer. It is true that some of these processes are not as neat and satisfying in appearance as relief printing, but when the work is to be used for office forms or for information to employees, its appearance is not taken into consideration.

The stencil screen process falls into the "economical" classification for three reasons: first, the elimination of printing plates as already mentioned and, in some cases, of photography; second, the elimination of presses or machinery (although a press has recently been developed that produces this work mechanically instead of by hand); and third, production by hand methods on a simple home-made wooden table with unskilled labor. The word "unskilled" should perhaps be changed to "semi-skilled" since registration and printing qualities must be closely watched in certain grades of stencil screen work.

Sales effort in the stencil screen process is helped considerably by the fact that the rough sketch furnished by the artist not only can be submitted to the customer but, when approved, may be used for guidance in the making of the stencil for producing the job. Art work in this process is submitted "same size" instead of enlarged form (for subsequent reduction) as in other branches of printing.

The first thing the stencil printer does in the production of his work is to make a frame to carry the subject. This is used as the plate would be used for printing purposes. It is made of wood, with the stencil cloth or fabric stretched across it as an artist's canvas is stretched.

Stenciling cloth is the nucleus of the process. This cloth or fabric acts like the screen in a halftone plate in that it is the medium for placing the ink or paint (the two terms are used almost interchangeably) upon the sheet or board. Several kinds of cloth or silk are used for this purpose, including the bolting cloth which millers use for refining flour, the chief requisite being that the meshes run straight and the openings be square and uniform. For this reason silk makes a very good medium and is extensively used. Silk, too, has the quality of resisting the chemical action of bichromates when they are used in the making of the photographic screen. Only good bolting cloth should be used for quality work. The number of mesh depends upon the fineness of detail desired.

Bolting cloth, or stencil silk, as it is sometimes called, can be obtained in 45-inch widths and in wider measure if specially ordered. There are about 29 different kinds of cloth, the difference being in the number of meshes to the linear inch. The cloths run from number 0000 to 000, 00 and 0; then from number 1 to 25. Number 0000 has 18 meshes to the linear inch; number 25, 200. These meshes correspond to the number of lines—150, 133, 120, etc.—in the halftone screen. It must be remembered, however, that the "screen" in the cloth stencil does not affect tonal value as a halftone screen does, but acts only as a medium through which the ink or paint is transferred to the sheet in the operation of printing. In this respect the cloth screen might better be compared to the screen in intaglio printing, which does not change the size of the dot, tonal effects being determined by depth of etching and quantity of ink. In the stencil screen process the same mesh is maintained over the entire surface and a flat color is applied to the sheet, the thickness of

this color being controlled by the thickness of the stencil through which the ink or paint is squeegeed.

The price of bolting or silk screen cloth runs from about \$2.50 per yard for the 0000 quality up to about \$15 per yard. There are three grades of bolting cloth; extra heavy, triple extra heavy and the regular quality previously mentioned. Prices for the heavier grades are a little higher than for the regular quality. In the triple extra heavy the number of meshes per linear inch is slightly less than in the regular quality because of the thickness of the threads in the cloth.

Organdy is another cloth which can be used for making the stencil screens. It is not as strong as silk and for this reason is seldom used. It is cheaper than the bolting cloth, prices ranging from 29 cents per yard to perhaps \$3.00 and, for the permanent finished quality, from 75 cents to about \$3.50 per yard. The widths run approximately 40 inches. Organdy does not withstand the chemical action of bichromates used in sensitizing the screen for the photographic method of screen making and shows deterioration immediately, which naturally affects the running quality of the screen. Organdy is tricky, requires experience to stretch tightly, seldom lasts for more than one job, and is risky to use on long runs.

Wire cloth is also used for making stencil screens, but is hard to handle because of the bulging of the cloth and because the rough edges of the wire wear out the squeegee and tear the sheet on which the job is being painted. Because of this rough edge in the wire, stencils made from wire cloth should not contain curves. The fact that it is difficult to stretch wire cloth is a further limitation.

There are several methods and kinds of stencils or screen plates being made today. This operation of making the screen is the most important part of the process, and the ability of the man making the screen plate will determine the kind of work that can be produced. The hand-cut-in screen plate, which is the name applied to the screen used for the printing or painting part of the work in the hand-cut-in method, is made as follows:

The frame, with the stencil cloth stretched across it, is laid face down on the O.K.'d sketch or design and the part of the sketch to be done in the first color traced on the inside of the screen. Care should be taken to provide enough space at the top and bottom of the screen to allow for the storage of the

paint used for the job. The principle of the paint screen process is to paint out with a filler, sometimes consisting of shellac, all the parts that are not to be painted in color, the remaining parts being left free and open in order to permit the paint to pass through to the sheet. The trade terms for this operation of painting-in are stopping-out, cutting-in or blocking-out. The operation is similar to the photo-engraver's method of painting out with asphaltum varnish those parts of the copper plate that are not to be etched.

After the screen has been traced, it is lifted off the sketch and painted-in in all parts that are not to contain any color. Lacquer enamels are most frequently used at present for blocking-out. The solvents, or rather the liquids used for thinners, render the enamel soluble, permitting the screen to be used several times over. When the enamel is dry, the screen is ready for use. There are times when a sizing is put on the screen before any tracing is done in order to protect the screen while being made. This sizing must be washed out of the screen before it is ready for use.

The frame is next attached to a table by means of a hinge of the common door type with a pin running through it. This pin, when lifted out, leaves the hinge in two parts, one fastened to the table and the other to the frame. When the screen is ready for use, the hinges are placed in position and the pins inserted in the hinges, the job being ready to run when the guides have been fastened to the table. The frame, held in register by the hinges, lifts up from the table, the guides allowing the proper margins. The sheets to be printed or painted are placed up to the guides in the same manner as on a job press, the frame is lowered, and the paint placed in the frame at the spaces provided for it. The squeegee, made of a piece of rubber fastened into a stick of wood, is then passed over the face of the screen, taking enough paint to supply the screen openings and depositing it in those openings, after which the frame is lifted off the sheet, the sheet removed, another sheet placed to the guides, and the process repeated. An arm swings at the side of the frame, fastened through a loose-fitting wooden screw, and when the frame is raised, this arm drops down to the table and holds it while the sheets are being shifted.

From the methods of handling and applying the color to the product, it will be readily seen that the paint screen process can be used with metal, wood, glass, and, in fact, any kind of material, regardless of thickness and pliability.

Another type of stencil used for this process is the knife-cut variety, known as the knife-cut stencil plate. In this method, the stencil plate is made by marking an outline of the color to be used on a sheet of paper, which may be bond, ledger, wrapping, tracing paper or the like. The thicker the material used, the more ink or paint will be deposited upon the finished product. The screen plate is made by sketching the image upon a sheet of paper and applying a coat of shellac over the paper, which is then cut out with a knife.

When dry, it is placed on a smooth surface and the silk screen is then placed on the cut-out, following which an application of heat is given through a pad placed inside the frame and a hot iron passed over the pad, the heat application causing the paper to adhere to the screen. When this has been done and all edges are fastened to the screen, the screen or plate is ready for running, which is done as previously described.

Still another type of stencil is made by flowing a solution of glue over the surface of the screen and the design directly on the inside of the screen. The parts that are not to print are painted out as in the hand-cut-in method. The glue is then washed out of the screen in those parts that are to contain color, and the plate is ready to use.

This type of stencil eliminates the sketching of the design. When the glue coating is dry, it is placed on the design and painted or blocked out directly upon the screen, the coating making the bolting cloth like a solid transparent sheet. The sheet is easily worked upon with shellac or any other blocking out material. This could not be done with the raw bolting cloth, as the blocking out would remain on the sketch instead of the screen. Care must be exercised in removing the glue. Water or even dampness on the back of the screen may mean the ruination of the job.

Artogravure stencils is the name given the silk screen made with the aid of photography. This is done by sensitizing the silk and printing the image directly on it, after which the sensitized solution (which has been protected from hardening by the light) is washed out of the screen. When dry, the screen is ready for printing.

This method does not require etching as on the photo-engraved plate. The image placed on the silk screen is hardened by the action of the light and the unhardened part washed out of the silk with water. This process makes it possible to retain minute

detail in the work which cannot be obtained by the other methods of making stencils. Line plate or hand-drawn negatives may be used. Fine detail may be retained by the camera more easily than by hand. At the present time some efforts are being made to use the halftone plate method of production. This, of course, depends upon the line used for the halftone and the screen mesh used for the stencil. Satisfactory results are said to have been obtained. This Artogravure method of making screen plates opens up many possibilities.

The size of stencil screen process jobs is limited only by the size of the materials to be printed. Paper stocks or other products for production limit the possibilities. Frames and other appliances can be made to meet the demands, and signs and posters may be produced in very large sizes.

There are generally two people to each frame when the printing or painting is being done, one operating the squeegee, the other racking the printed or painted sheets. It is necessary to rack this work because of the amount of ink or paint on each impression. Production by the hand method runs from about 2,000 per day on small work (size 14x22) to a few hundred per day on the extremely large sizes. With automatic press production, an output is claimed of 1,000 per hour.

Because of the large amount used, ink or paint consumption is an important factor in this work. The ink or paint is bought by the gallon. Both opaque and transparent paints are used in this process with satisfying results, the thickness of the film being controlled by the thickness of the screen. Where colors are overlapped, the thickness of the film of the superimposed color becomes apparent to the eye. As this heavy film is apt to interfere with the squeegee action, thin layers should be used on color work.

The cost of doing work by the stencil screen process depends upon the method used in production and the kind of art work required. Costs for the latter are the same as in other printing processes. Negative and positive costs may be ascertained from the photo-engraver. When sensitized screens are to be made, the cost of preparing the negatives, together with that of the other materials, should be added to the cost of making screens and printing or painting. The cost of the material on which the job is to be run is another important item.

Ink consumption for this kind of work with coated stock runs about one gallon for 400 impressions on a solid form, size 14x22

inches. This is for black paint. Colored paints give less coverage. Rough stock absorbs more paint, and for this reason coverage is not so high as with coated stock. The cost of paint varies according to the color and grade, black costing about $4.00 a gallon and yellow, red and blue $6.00.

Chapter XXXIII

Summary of Processes

Ability to appreciate prints or pictures of any kind depends upon a knowledge of how they are made. It is not necessary for a pressman to be able to paint, etch, or engrave pictures but he should be able to tell something of the way in which the work is produced.

It is the purpose of this explanation to cover the salient parts of various kinds of reproductions and explain the difference in the method of production. Average specimens of graphic reproductions are sometimes similar in the appearance. It is necessary to carefully scrutinize prints of various kinds to find the important factors that will reveal the process used in reproduction.

It is especially important that pressmen should be familiar with every method of reproduction that competes with the relief or letterpress process. Certain jobs may be produced either in letterpress, offset lithography, stone lithography or the rotogravure process. The pressman should know the possibilities of all these processes.

All processes of reproduction fall into one of three classes, namely, Intaglio (below the surface), Planographic (on an even plane), or Relief (above the surface—known generally as Letterpress).

The first duplication of engraved characters was in China about 150 A.D. These duplications were made by means of rubbing for the impression on engraved stones. About 700 A.D. engraved blocks of wood were used and in Japan by the year 1770 it is said that about one million Buddhist images had been printed. About 1294 Persia was printing money by this method. Egypt was also making wood block prints. Block printing in Europe began about the year 1400. At this time the process used in the manufacture of these blocks was performed with knives and chisels. The printing was done somewhat differently in that the Oriental painted the block with water-colored ink and took the impression by hand. In Europe the printing press impressions were being made with an oil ink. The Oriental method remains unchanged while the oil ink method (relief, letterpress or type

printing as known today) has developed into one of the greatest industries known to civilization.

Wood Engraving

The Oriental method of making wood block prints provides for the design to be drawn on very thin paper. The paper is pasted face down on the block and the wood between the lines is cut away with a knife or a chisel. In Japanese color printing the prints from the key block are pasted face down on the blocks that are to contain the other colors. The parts of the block which are to print the other colors are preserved while the rest of the block is cut away. The Japanese use a great many colors in producing their wood block prints.

In Europe the blocks are cut with the same kind of tools and in the same manner. The first wood cuts made were in outline only, but the technique for big masses of shaded sections of the plate was later applied. In 1770 Thomas Bewick is credited with having used box wood cut across the grain for the manufacture of his wood cuts. To him is also attributed the pioneer use of a graver in cutting his wood blocks. The details demanded by tones and textures was finally acquired in this method of cutting wood blocks. Alexander Anderson is credited with the first use of this method in the United States.

Photography affected the method of cutting wood blocks as it eliminated the necessity of drawing the design upon the block for transferring it on thin paper. The design is now transferred to the block by photography.

In the United States wood engraving saw a gradual rise from the weak attempts first made by our colonial craftsmen. This effort ran through the period of our early colonial ancestors up until the founding of the so-called new school, which took place about 1877. This school had an effect upon the quality of the work being produced in this country and a high state of perfection was reached for this particular type of wood engraving.

The advent of the halftone process affected the use of wood engraving and this method of manufacture gradually declined until it is practically non-existent today. With the passing of wood engraving the celebrated engravers were forced to seek other fields of endeavor. Some turned to painting and copper engraving while others entered photo-mechanical establishments and

took up the method of reproduction that had supplanted them.

Line Engraving

Intaglio engraving in the line on metal was first used about 1440. The part of the plate which prints the design is cut out of the metal with a graver. The method of cutting this plate is controlled by the way in which this tool is held in the palm of the hand, the pressure being exerted on the tool handle in the palm of the hand while the thumb and forefinger guides the tool in the direction in which the insertion is to be made. This cutting tool has a "V" shaped edge and the grooves that are cut by the tool vary in width and depth, one end of the line generally being of fine dimension. This kind of line helps in identifying and engraving in line. Line engraving today is usually a combination of the engraving and etching and is generally used for bank note work, bonds, money, etc. It is generally produced on steel. The term "Steel Engraving" is often incorrectly used for a line engraving. The steel did not come into use for engraving until after 1808.

Bank Note Engraving

Bank note engraving is the principal kind of "Steel Engraving" to which the name can be rightfully applied.

Generally the greater part of an intaglio engraving is etched but the most important part is really engraving. Jacob Perkins in about 1808 is credited with being the discoverer of the process of hardening soft steel which is used in duplicating plates in bank note work.

The method of producing duplicate plates is to pass a soft steel roller over the original plate which has been hardened. This roller is then hardened and can be used to make many duplicate plates by pressing into soft steel. These duplicate plates are then hardened and used for prints.

The United States Bureau of Printing and Engraving has a permanent exhibit covering this method of plate making which has been developed to a high degree of efficiency.

Stipple Engraving

The usual method of engraving stipple plates was first to cover the metal plate with a thin coat of wax. The design was then picked with an etching needle. The plate was then etched with acid and the very many varying degrees of tone were controlled

by stopping out the parts of the plate to be protected from the mordant. Stipple engraving was in great use around the year 1771 to 1812.

Dotted plates for printing were used about 1500 and were made by various methods of punching. This method had been used by goldsmiths for centuries for decorative purposes.

Mezzo Tinting

Mezzo tinting is performed by the use of a plate which is covered with a ground secured with a tooth instrument called a "Rocker." This rocker breaks the surface into myriad minute projections and cavities which hold the ink in printing. Roulettes were used at one time for making a ground by rolling the roulette over the plate. The picture was completed on the plate and the reproduction secured was approximately the same as the later methods.

After the plate is prepared by the rolling or rocking the artistic work begins by working a steel scraper over the plate which cuts away the minute projections, thereby reducing the depth of the cavities. A burnisher is sometimes used in reducing the height of the projections and smoothing out the rough places in the plate. All gradations of tone from the initial black and white can be produced as the complete elimination of ink holding cavities produces the white sections of the print.

The engraver works from black to white. This is the direct opposite of other methods of engraving.

Etching is sometimes used in connection with the mezzo tint. In this case the design is etched in outline before the plate is grounded.

Mezzo tint plates are very delicate and the surface wears away much faster than a line engraving. A difference could be seen in the first and fiftieth impression taken from a copper plate which did not have a steel facing.

Mezzo tints were at one time used for color printing. In 1730 Jacob Lebon was the first to produce prints for a three-color theory of Sir Isaac Newton.

Drypoint Etching

Drypoint etching is made without the aid of acid. In reality it is not an etching because the design is cut into the plate with a steel or diamond point. The method of cutting does not remove any of the metal but cuts furrows on one side of the line.

The projection is sometimes called a burr. In this case both the furrow and the burr hold the printer's ink. The burr may be partly or entirely eliminated, in which case that section of the print will contain a very fine, thin line. When the burr is left on the plate the plate contains a rich and velvety tone. Drypoints are really earlier than etchings, having been dated back to 1480.

Etching

When etching intaglio the design is cut or scraped through a wax ground on the metal plate. The metal thus exposed is etched with a mordant. The depth and width of these lines are governed by the time the mordant is allowed to remain on the exposed part of the plate. When lines are sufficiently etched they are stopped out to protect them from further etching while other parts of the plate are treated for greater depth or wider lines.

When the plate is finished it is cleaned and inked, the ink filling the etched lines, the surface being free from ink. Damp paper is used in this process for the impression. The dampened sheet is laid over the plate and run through an engraver's press under great pressure. The impression is known as the etching.

Aquatint

The aquatint method of making plates dates back to about 1765. It is used to imitate wash or colored drawings. It has probably derived its name from this fact. Two methods are used in this plate making process–a wet and a dry method.

The dry method consists of covering the plate with an even layer of powdered asphaltum or resin. Heat is applied to the plate which burns in the minute particles of asphaltum or resin and forms minute dots that protect the metal at the point to which they are attached. The parts which are to remain white in the finished print are stopped out similarly as in etching. The plate is given a flat bite for each tone, the stopping out taking place between the bites. When the plate is finished the tones will be divided between the white paper and the extreme solid which generally shows about six different tones.

In the wet method resin is dissolved in alcohol and when poured over the plate the alcohol evaporates and leaves the resin exposed on the plate forming minute dots as was the case with the asphaltum. The exposed plate between the resin dots is etched as

previously explained and the stopping out is done in the same manner as with the dry method.

Color etchings are sometimes made from aquatint plates.

Color Printing from Intaglio Plates

Etching, Roulette, and Aquatint are sometimes combined for use in the finished product. Several methods are used in the reproduction of color printing. The print may be made at one impression from one plate which would contain all the colors or from one plate using several impressions, each impression in a different color or from several plates, each in itself an individual and proper color.

It is difficult to make prints in color using intaglio plates and really good color prints are rare and valuable. Color printing from intaglio plates dates back to around 1700.

Modern Intaglio Processes

Photography has played an important part in the field of the graphic arts. The photo-mechanical processes assist in all three classes of reproduction. Photogravure and rotogravure are the most used of the intaglio processes today. There was a time some years back when mezzo tints, line engraving, stipple engraving and dry point etching were used considerably, but these are now found in the "art" divisions of the industry. Bank note engraving, plate printing and steel die stamping are still used commercially and generally understood by all who handle the printed product. Most plates used for plate printing, die stamping and bank note engraving are cut by hand. Rotogravure and photogravure use photography and are of great interest just now because of the inroads they have made in the field of work that was once produced by letterpress.

Rotogravure and Photogravure

Several different trade names are being used in connection with the production of Rotary Intaglio Printing in both black and white as well as color. The name "Rotary" denotes the method of printing from a cylinder as compared with a flat surface.

Rotogravure is the outgrowth of the process used to reproduce artistic masterpieces. They were photographed and etched in a copper plate and this plate served as the printing plate for the reproduction. The image was etched beneath the surface of the copper and ink was rubbed into the etched parts of the plate. The superfluous ink was wiped off the surface of the plate by

hand and a dampened sheet of paper stock was then pressed against the surface of the plate and took the ink out of the etched parts.

This same method, except the use of the dampened paper, is applied to a copper cylinder on which is etched an image and a screen in much the same way as the screen is used in the halftone plate for letterpress printing. The preparation of rotogravure printing cylinders is done with transparencies which are made from various photographic negatives. These are assembled on a piece of glass which is a slight bit larger than the surface of the cylinder. After suitable retouching has taken place a sheet of sensitive carbon tissue is placed on the glass and exposed under the transparencies. A halftone screen is then printed over the sensitive tissue in a second exposure. The carbon tissue is then placed on a printing cylinder which is made of copper, either solid or hollow, whichever the case may be. It is then developed and etched as previously explained under photogravure. Considerable stopping out is done in this process, Asphaltum varnish used for stopping out.

The screen for this rotogravure cylinder is put there to break up the image and also to protect the design by acting as a rest for the doctor blade. This is a steel round edge knife which is used for wiping off the surplus ink from the surface of the cylinder. The etched cylinder is placed in a trough or fountain of ink. The cylinder revolves in this ink and the doctor blade wipes the cylinder surface clean just before the impression is taken on the sheet.

There are no methods of reproducing the printing surface of a rotogravure cylinder such as we have in the letterpress process through the electrotype and stereotype processes, except in bank note engraving where duplicates are made by the use of pressure rollers. Each job must be etched separately and as many times as there are cylinders required for the run. In this sense the requirements for rotogravure etchings are the same as if the letterpress printer had to have new photo-engravings for every page in the form and every form on the press.

There are only slight possibilities of finishing a rotogravure cylinder as the photo-engraver finishes his plate through stages of re-etching. The gravure cylinder is etched and staged out (stopped out) and etched again in order to get the desired tonal values in the job. But once the cylinder is washed off and ready for printing there is little chance of re-etching. Because of this

necessity for perfection at the first etching, it is necessary to have all the required detail in the negatives and positives which are retouched, in order to get tonal gradations up to satisfactory contrasts.

Rotogravure in a commercial sense has been devoted mostly to one-color jobs although color work is done occasionally. Registration is one of the chief difficulties encountered in color gravure. The entire form must be etched as one unit. It may be transferred to the cylinder in sections, but the medium of transfer, being a carbon tissue, is itself affected by the atmospheric conditions while being exposed and transferred. These carbon tissue changes affect the register of the job and once the cylinder is etched there is no possibility of moving any of the pages or spots into register. Hence the cylinder that does not register must be made over until all colors are in satisfactory register.

Rotogravure work is generally printed on a web press, although there are several standard makes of sheet feed gravure presses in use today.

Photogravure is the same as rotogravure except that rotogravure is etched directly on the cylinder, while in photogravure the job is etched on a flat sheet of copper, which is fastened around a cylinder which then operates in a manner similar to the rotogravure method. This is now the accepted difference in the trade although originally photogravure also used a heavier ink.

Photogravure is an intaglio process of making prints for which there are several methods. The history of this process is interesting because of the various claims made as to founders of the process. The first photogravure was made in 1826 in France by Joseph Necephore Neipece. About twenty-five years later W. H. Fox Talbot patented a process called "Photoglyph." In 1853 Niepce de Saint-Victor and Mante, of France and Paul Pretsch of Vienna were producing plates simultaneously. None of the processes of these gentlemen were a commercial success. W. A. Leggo of Canada developed in 1865 a process called "Leggotype." About 1866 General Frederick von Egloffstein of New York patented a process using a screen. About 1867 a method known as "Garnier" was used by Dujardin of Paris. This method was a modification of the Fox Talbot process. Fine work in this process was being produced around the year 1870 by Goupil. It was from this point on that photogravure was well established.

One successful method for this process uses a reverse transparency made on gelatine and in the exact size of the job to be reproduced. This is printed on bichromated carbon paper which really is a tinted gelatine attached to a sheet of paper. This is squeegeed to a copper plate which has been prepared by having all the foreign matter removed from its surface. Hot water is applied to the carbon paper and the paper is removed from the gelatine film. The hot water dissolves the soluble gelatine, which has been left soluble by the light passing through the transparency.

The state of the gelatine and the application of hot water leaves varying thicknesses of insoluble gelatine. This variable film governs the speed of the mordant which consists of perchloride of iron in various strengths. The dark portions of the design begin to etch first. The strength of the mordant is reduced as the lighter values are being etched. Thus the range of the picture is obtained in the plate. The plate after being cleaned is prepared for printing by filling the depressions with ink and wiping off the surface of the plate. These prints are made on an engraver's press and contain beautiful depth of tone.

Rotogravure and photogravure have exclusive qualities in softness of detail and depth of tonal values. The ink used is very thin and the paper is generally soft. This combination blends into a softness which resembles a photograph except that the screen is present. The tonal value in this process is obtained by etching variable depths in the cylinder. This tonal value in photo-engraving for letterpress halftones is secured by changing the size of the dot while the etching is of uniform depth. In gravure the dot remains the same in size, but the depth of etching varies and the film of ink deposited by each dot is of varying thickness. This allows for the different tonal values in the job. Gravure is one process wherein a solid and extreme highlight although right beside each other will receive the proper amount of ink for the tonal value without affecting either tone. Solids run full color, highlights run clean. Responsibility for this result is transferred from the pressman to the etcher because all ink carried on the job is controlled by the depth of the ink cells in the etching.

All type used in these processes must be set in the usual way. Some proofs are photographed and stripped in the negative. Others are pulled on onion skin, then bronzed for greater opacity or printed with opaque ink and used for the strip-in.

When an etched cylinder in gravure begins to show signs of wearing, the highlights disappear entirely. The solids become lighter. The intermediate tones become highlights. This is due to the fact that the ink cells carrying the ink have become more shallow and deposit less ink than originally allowed for in the etching. This condition is reverse of that found in the letterpress industry, where a wear in the plate will show darker tone instead of lighter tone as the job runs on. A cylinder for newspaper gravure will run about 400,000 impressions. For a flat plate gravure the impressions are about 150,000 per plate. Much depends upon care and adjustment by the pressmen in this instance.

Planographic Processes

The Planographic process embraces stone lithography, offset lithography, direct lithography, aquatone and photogelatin. Planograph is a trade name for certain methods of offset production.

Lithography

Lithography was invented by Alois Senefelder in 1798. The process is one of printing from a flat surface which has been prepared by drawing a design in greasy substance. The grease is set by a procedure called "etching" which simply attaches the grease firmly to the surface of the plate or stone.

The prepared surface of either the stone or grained metal is wet, then inked. The ink sticks to the greasy parts only and is thus printed. The print is an exact facsimile of the drawing. But it is in reverse. In direct lithography it becomes necessary to make a transfer which will permit of printing the work to read from left to right.

In line work a greasy crayon called "Tusche" is rubbed up and mixed with water, making an ink which is used with a pen to make the line drawing on the stone. This stone is prepared and printed in the same way as the other prepared surfaces.

The color work in lithography was at one time called chromolithography. Many colors were used in order to get the desired effect.

Stone lithography has progressed with the other processes in that photo-mechanical reproductions are made directly on the stone in the same way that the photo-engraver would make a halftone. Hand work in stone lithography is less in use and photo-mechanical methods are fast superseding it. Stone lithography at one time required 12 to 14 colors for reproductions, but the perfection of the process method of reproduction applied to the offset industry has enabled the lithographer to get a faithful reproduction of a painting in as low as four colors. There are times when a fifth color, a grey, is used in addition to the four colors, namely, yellow, red, blue and black.

Photo-Lithography

Credit for the invention of the photo-lithographic process is given to John Walter Osborne of Melbourne, Australia, in 1859. It was introduced in this country by the inventor in 1861.

Photo-lithography differs from previous lithographic methods in that the design made upon paper or other similar substance can be transferred to the stone or zinc plate photographically. Prior to this method it was necessary for the originating artist to draw his work upon the stone himself or have it copied by another artist.

The halftone screen is used extensively in this photo-lithographic method of printing in colors.

The step and repeat machine can be used to make up a multiple job printing plate and will transfer the image to the plate to the exact position within .001 part of an inch.

Offset Lithography

Lithography has two methods of transferring the image from the stone or metal surface to the sheet. These are direct and offset. The direct method transfers the image to the sheet directly from the plate or stone. Offset transfers the image by first putting the impression on a rubber blanket and then transferring it from the blanket to the sheet. In this case the original on the zinc plate is not in reverse but reads from left to right. When it is transferred to the rubber blanket it is in reverse and when printed on the sheet again reads from left to right.

Plates for this method are made either through the application of photography and photo-mechanical methods or through the hand transfer method which developed from the old method of lithography when it was produced from the stone.

In offset lithography, the ink deposit for halftones is of uniform density. Variation in size of dots produces the tonal gradation of the finished halftone impression.

On account of the use of a rubber blanket this process is adaptable to printing on rough paper. The resiliency of rubber causes the blanket to conform with any irregularities of the paper

stock. Coarse papers can be printed in this method without destroying the physical characteristics of the paper stock which are lost in the letterpress method of reproduction because of the squeeze required to obtain the proper impression.

Deep-etched plates permit of 250M. impressions or more, whereas the albumen offset plate averages about 50M. impressions, more or less. On albumen offset plates the image is developed on a bichromate glue base and if the base leaves the zinc plate the image moves off the plate. In deep-etched plates the image is protected by being below the surface of the plate.

Detail in the halftones used for offset printing must be retouched in the negatives and positives because the finished plate, like the gravure plate, cannot be successfully re-etched or burnished like a photo-engraving after the printing plate has been made.

Wet plate negatives for photographic reproduction are made in the same manner for offset lithography as for letterpress. The job is made up and proofs pulled suitable for photographed reproduction. The new trend in this process is to pull proofs on cellophane or onionskin stock for photo-mechanical reproduction. These proofs must be absolutely opaque and special ink must be used for the purpose; after the proof is pulled they should be dusted with either dragon's blood powder (used by lithographic industry) lamp black or bronze powder. Proofs must be free from specks or dust particles, as each particle when not removed from the proof will be reproduced on the offset or direct lithographic plate. A special reverse type for offset printing has been made to facilitate pulling of proofs to reverse the work.

Problem of Register

Because the entire form is laid down on one plate in lithographic work, the matter of register in color work is one of deep concern. There can be no moving of individual plates or subjects into register if the paper changes or if the plate does not register, except by stretching around the cylinder. It means a new plate. One-color jobs, naturally, do not have this hazard. Cross cylinder paper changes present a register problem which is very difficult to overcome. Atmospheric control in pressrooms has eliminated a considerable part of the difficulty.

Offset lithography has promoted the use of uncoated paper stocks. There are times, however, when coated stocks are successful in this industry, as will be attested by the fact that litho

coated one side was originally made for the stone lithographic trade.

Direct Lithography

There is also a direct process of lithography which transfers the image on the zinc plate directly upon the paper stock. This method eliminates the necessity of offsetting on a rubber blanket and is used generally for coarse work such as window posters and outdoor billboards. Many of the chain store posters are painted directly on zinc plate after which the plate is treated and etched and delivered to the pressman.

Flat bed and rotary presses are used for the direct method of reproduction. The flat bed presses used are generally those formerly used for the stone lithographic work, the zinc plate being tacked to a wood block fastened to the bed of the press in the same position that the stone previously occupied.

When additional press plates are required, the lithographer must use either additional negatives or transfers which must be placed in perfect register for each color by the sticking-up process if the transfers are hand transfers and by the step-and-repeat machine if photographic transfers are used.

Photo-Gelatin Process

Photo-gelatin is also known as collotype and heliotype. It is the process which produces a result most nearly like a photograph. The omission of a mechanical screen produces a continuous tone.

The process of printing via the collotype method consists of a film of gelatine supported on a glass or metal plate sensitized to light with bichromate, exposed under a photographic negative and then swelled in water. The varied intensities of light passing through the negative harden the gelatine in different degrees, thereby regulating the amount of ink accepted by the different parts of the plate in printing. In dark portions which have been most hardened the full strength of ink is received, while in the light portion the gelatine repels the ink. Reticulation of the gelatine varies with the amount of light received and thereby helps the effect. The process is said to have been discovered by Alphonse Louis Poitevin, a Frenchman, and patented in 1855. Ernest Edwards is credited with having perfected the process in this country and patented it in 1872.

Freedom from the mechanical effects of halftone or other screens makes the collotype print a very satisfactory method of

reproduction. It handles difficult subjects, including works of art and reproduces the minute details to perfection. It is now being used extensively in advertising and produces prints which have somewhat the quality and detail of a photograph.

The photo-gelatin process, like the rotogravure and offset printing processes, requires the entire form to be laid down on the printing plate as one form. Heavy plate glass was the foundation for the photo-gelatin plate, but modern methods are substituting metal for the base. This permits of greater speed through rotary production.

There still remains a big hazard in that plates for color work must be in exact register for all colors. Control of color is difficult in the three-color work because the plate loses moisture and takes more ink. This condition prevails during the entire run. Color variations in each and all of the three colors naturally affect the color values of the finished work.

Aquatone Prints

Aquatone is a modification of the collotype process, this being a trade name applied to a recent development in the photo-mechanical field which is a cross between the offset and the photo-gelatin processes. It was patented by Robert John of New York on April 24, 1923.

The plate, which is used for printing, consists of a thin sheet of aluminum covered with celluloid and gelatine. The gelatine is sensitized with bichromate and the photo-mechanical negative is printed in the usual way. The printing surface is perfectly smooth gelatine, some parts of which will absorb water, and others will attract ink, according to the effect of the negative.

The plate is placed in a printing cylinder of a lithographic offset press. A dampener containing water is first applied, the plate is then inked and printed on a rubber blanket after which it is transferred to paper.

Aquatone uses a screen of four hundred lines to the inch. This insures a uniform fine grain to the print. To the naked eye the print is usually equal to the original, and looks much like a photograph. The screen, however, prevents a completely continuous tone such as is contained in a photograph.

All the detail and tonal gradations must also be inserted in the negatives and positives in the process. Developing of the printing

plate does not permit of bringing out detail as can be done by the photo-engraver with a letterpress halftone plate.

Letterpress

Letterpress or relief printing embraces a number of processes of reproduction including type, photo-engraving, four-color process, electrotype, stereotype, wood cuts, water color printing and thermography.

As previously noted, the relief process of printing was the first to be used historically and has in many cases formed the basis for improvement in all graphic arts processes of reproduction.

Photo Mechanical Relief Printing

Reproductions of line drawings are called "line cuts" and the reproductions having tones in them are called "halftones." Methods for reproduction of line cuts were developed between 1870 and 1880. Prints with tone contained in them were made as early as 1853. About 1881 mechanical screen effects were put into commercial use. Considerable controversy regarding the inventor of halftones has been prevalent for the past few years. Some authorities give this honor to Stephen H. Horgan of New York and others give it to Frederick E. Ives of Philadelphia.

Making a Line Cut

Photographic work pertaining to the making of line cuts is called "wet-plate photography." The plate is sensitized and used while wet. The plate is first coated with a solution of ether, alcohol, and gun-cotton—the solution being known as "collodion."

When the collodion is partially dry the plate is emerged in a solution of silver nitrate, making the collodion film sensitive to light. After the plate has been senitized it is placed in a plate holder and then in the camera. Prior to the sensitizing of this plate the original copy to be photographed is generally fastened to the copy board of the camera, which is illuminated with arc lights, and focused to the desired size. The proper exposure. which is governed by the amount of reduction or enlargement and the strength of the arc light, is then made.

Wet plates are developed with a solution of sulphate of iron and acetic acid, and water is flowed on the surface while the plate is held in the hand. Fixing is done with a solution of sodium of cyanide. The intensification of the negative is accomplished with solutions of copper sulphate and silver nitrate and a weak cyanide solution. Sodium sulphite is used to increase the density.

The negative film is then stripped from the glass plate and placed upon a plate-glass which is known as a "flat." The flat is placed in a vacuum printing frame in contact with a piece of sensitized zinc. Exposure is then made through powerful arc lights, the light passing through the negative to the sensitized surface of the metal.

The zinc plate is then rolled with a leather roller and a specially prepared ink. It is next placed under running water and gently rubbed with a tuft of cotton. Where the negative was transparent the light makes the coating on the zinc insoluble. The soluble part of the coating is washed off the plate exposing the bare zinc.

The zinc print is warmed to permit the ink to become tacky. Dragon's blood powder is then dusted over the surface of the plate and sticks only to the ink portions. The plate is again heated and the dragon's blood coating melts. The plate after being cooled has an acid-proof coating over all the lines of the picture in the form of the ink and dragon's blood previously applied.

The plate is placed in an etching machine which contains a solution of nitric acid and water. This solution etches away the unprotected portions of the zinc plate. Several bites are required. Between each bite the plate is washed, dried, and redusted with dragon's blood powder to prevent the lines being underbitten. After the etching is complete the acid-proof top is removed with hot lye. Large areas of plates which are not to print are cut away to sufficient depth with the aid of a routing machine. This is to eliminate the possibility of having the bottom of the plate come in contact with the surface of the paper while printing.

Proofs of these plates are usually done on a hand press and act as a guide to the engraver to show the possibilities of correction.

Making a Halftone

Preliminary preparation for making a halftone engraving is the same as explained in the making of line cuts. The cleaning of the glass, the coating with collodion and the sensitizing in the silver bath are all the same up to this point. There is some difference from this point on because the copy is not restricted to drawings which contain black and white lines exclusively but includes also photographs in all tones of gray from black to white, wash drawings, paintings, or any other similar objects. It is necessary to break up the entire subject to be reproduced into minute

black printing dots which make the various tones in the finished plate. Every part of the final printing plate must either be solid black dot or leave a clear white paper.

This result is obtained with the aid of a halftone screen. This screen is made of two pieces of glass, each ruled with diagonal opaque lines and cemented so the lines cross and form a mesh. The screen is placed in back of the camera but in front of the wet plate. During the exposure the image passes through the lenses, then through the halftone screen to the plate. Each minute opening in the halftone screen acts as a small lens and projects a tone of light on the plate. This reflected light from a dark spot on the copy produces little effect or only a small dot. If the reflection comes from a light portion of the copy the greater volume of light produces a larger dot on the sensitive plate. The variation in the size of these dots controls the tones when the finished plate is printed.

The plate is developed, fixed, intensified and dried. It is prepared by stripping as previously explained for line cuts. The "flat" is placed in contact with the negative and exposed under the arc lights similarly to the line cut method. The plate is next put under a stream of running water which dissolves the coating between the dots which was not exposed to the arc light. The plate is then soaked in violet aniline dye which makes the picture show plainly on the metal. The print is burnt in over a gas stove and then cooled slowly. This turns the coating into a hard acid-proof enamel. The plate is cleaned with a mixture of acetic acid and salt in order to remove all traces of coating from between the dots.

A flat etch is first given generally in an electric etching machine. Directly following this the re-etching takes place. Re-etching consists of painting out these portions of the picture with acid-proof varnish and continuing the etching action on those portions which are to be etched further.

Proving is generally done on a hand press. There are times when hand tooling in a plate is necessary in order to get out a desired detail in that particular part of the plate.

Four-Color Process Printing

Four-color process plates are made similarly to the one-color halftone previously explained except that they are more complicated in manufacture and color sensitive plates are required instead of the wet plates as used in the halftone. The separation of

colors requires these special photographic color sensitive photographic plates, and the exact demands made by registration require careful consideration for each detail in manufacture.

Etching and re-etching and printing of the plates is done similarly to the halftone engraving manufacture but photography is handled in a somewhat different fashion.

Because of demands made in registration it is not permissable to strip the film off the plates as done in halftone printing. In order to get a reverse position in the negative the object is photographed through a prism which reverses the image on the plate and eliminates the necessity of stripping the film.

The colors are separated out from the original copy while being photographed. The color filters used for the yellow, red, blue and black plates are chosen according to the demands made by color values contained in the copy to be photographed. Usually the color filter for any one of the three plates—yellow, red and blue—is the combination of the other two colors. Hence, the yellow plate would use a purple filter, the red plate a green filter, and the blue plate an orange filter. The black plate generally uses a yellow filter because this plate is used to subdue certain tones in the plate to give a more faithful reproduction.

There is no regular formula used in the superimposition of these four colors while being printed. The demands made by a keyplate in the combination of four colors may necessitate the printing of the keyplate first in order to insure suitable register in the job. When all colors make similar demands the usual procedure is to print yellow, red, blue and black. But, if the progression is yellow, red, black and blue, the finished product will carry a greater sheen than when the black is printed last instead of third. When dark colors precede the lighter colors it is necessary to use transparent inks to permit the darker colors to show through the lighter transparent colors which are superimposed upon them. When opaque colors are to be used it is always necessary to print the lighter colors first and the darker colors on top of them.

It is not always necessary to wait for one color to dry before the second or following color is printed upon it. Some of the modern machinery permits of printing two or four colors in one operation. When this superimposition of wet colors is being done it becomes necessary to treat the ink in such a manner as to permit the colors to retain their independent hues or shades instead

of mixing with each other and thereby ceasing to meet the demands made by the four-color plate.

Ben Day Shading Mediums

This method of obtaining various shades in the printed plate was invented by Benjamin Day. Its object is to obtain tone or color in the reproduction of an outline drawing. The process consists of making, for a four-color job, four zinc plates of the line drawing. The parts of the plate that are not to have any tone are painted out with gamboge. The shading medium consists of transparent gelatine films which carry various designs on the surface, these designs being somewhat higher than the film surface itself. There is a considerable variety of tint combinations. The film to be used for Ben Daying is inked with an ordinary roller and acid-resist ink. The film is then placed in a frame and laid face down upon the plate. The film being transparent permits the Ben Day artist to see the outline in which he is to place the Ben Day design. The design is transferred to this part of the plate by means of pressure being applied to the back of the film. The size of the dot is varied by the pressure and by the shifting of the gelatine tint. A micrometer adjustment is contained in the frame which holds the gelatine film to permit of adjusting the design to one-thousandth part of an inch. After the plate has had the Ben Day laid upon it the gamboge is washed off the plate in the usual way. The Ben Day artist knows by experience how much color is needed to procure the desired effect. In four-color work all four plates are treated as explained previously and each plate is given consideration as to which portions are to receive the Ben Day tones required. Superimposition of the primary colors—yellow, red and blue—in combination with a black key plate give delightful results.

It is not always necessary to reproduce Ben Day work in color. It is possible to incorporate a Ben Day film with a line plate and print the entire plate in one color, the Ben Day film showing a tone or design as selected for the purpose.

Water Color Printing

There is a recent adaption of the Japanese method known as the "Japanese wood cut" applied to the power press. In June 1926 a process was patented known as "Jean Berte" process of water color printing. This process replaces the wood blocks by plates cut in rubber for the flat colors and a photo-mechanical key block for the design. The design key block is printed with

ordinary printer's oil-content ink. The rubber plates are used to print the flat colors with a water base ink. Rubber ink rollers are sometimes used instead of the composition rollers and the work is performed on an ordinary letter printing press. These prints dry as soon as they come from the press.

The brilliant colors obtainable have created a demand for the product. Superimpositions of colors make many color combinations possible. In hand-cut rubber plate making the camera is eliminated although when zinc plate or electrotype key plates are used the camera comes back into the process. Production advantages are gained in this process in that the ink sets and dries quickly permitting the job to be handled shortly after printing.

Silk Stencil Printing

(See the Stencil Screen Process for details)

A patent was issued in January 1928 to the Selectasine Patents Company of San Francisco. It is applicable to any flat surface such as paper, fabrics, wood, leather, metal and glass. A silk bolting cloth is used in place of a cut stencil and may be printed on a power press. Those sections of the silk bolting cloth which are not to print are blocked out with a fluid which fills the openings in the silk. A squeegee is used which draws the paint across the surface of the silk and forces it into the stencil in those parts which are not blocked out. A heavy quick-drying paint is used. A separate and individual stencil is required for each color that is to be used in this process. The process sometimes called point screen can be applied to paper or cardboard by a hand method.

Thermography

Thermography is a process which secures a raised effect like copper plate engraving without the aid of dyes or plates.

This process is carried out by printing the subject with specially prepared ink on a relief printing press in the regular manner. The impression, while still wet, is dusted with a resinous powder and then passed through a heating oven. The heat fuses the resinous powder and raises it above the surface of the paper, in this way securing a raised or an embossed effect on the finished product. Recent developments in this process have perfected a flexible compound which does not permit the finished product to crack off the sheet. The product of this flexible method has been known to withstand the assault of a hammer on its surface without cracking.

The process is used in combination with color printing for the reproduction of greeting cards with satisfactory results. The application of gold in this process makes for a unique effect. It is possible to secure either a dull finish or a high glossy finish in this process. Commercial printing outlets are being found daily for thermography and its horizon of possibilities is widening.

Printing For the Blind

Writing Braille on a desk slate consists of making the proper indentation in the paper. A stylus which is held in the hand is guided by the metal strips between which the paper is placed. The Braille writer accomplishes the result by embossing one letter at a time by means of six keys. In reading Braille writing the left hand holds the place while the right follows each line of text.

The Braille Process of printing for the blind is now being used for duplicating books and other printed matter by various agencies interested in the subject. The work is being done by equipping those interested in the duplication with a desk slate or Braille writer and in this way the work is transcribed from the work being duplicated. The pages are "processed" or so prepared that they become plates from which the printing is done. Numerous copies of each page are thus produced from one transcription at a small cost.

In printing for the blind there is used an ordinary punch press. In this punch press is inserted a double sheet of zinc, usually double the size of the page to be printed, and is folded exactly in half and set into the punch press. Then blunt punch perforations are made through both pieces of zinc creating a male and female die. This sheet of zinc is then turned over and the other side is perforated the same as the first side.

The plate is then attached to the platen on the printing press and the top sheet is lifted and attached to the grippers. The bottom sheet being held fast to the platen and the sheet to be stamped is then inserted between both sheets of the zinc and the press set into motion as in printing without ink or rollers.

The sheet upon examination will then show Braille printing on both sides of the sheet. This is a decided advantage over all other methods.

There is another method of using Braille characters on the monotype machine. Patent No. 1936089 granted November 21, 1933 to H. R. Jacquerod. The page is entirely set by monotype and inserted in an ordinary printing press, with special ink and rollers.

An impression is taken on a sheet of wet matrix board. This matrix when allowed to dry becomes a female die. Pressure is then relieved and you have a male and female die that will last many thousands of impressions.

When the impression is taken the ink covers the side and the bottom of the impression. The sheet is then dusted with a permanent compound and subjected to a certain degree of heat which gives a reinforced dot. This is superior to the method described above since the dot is permanent it cannot be depressed by constant reading. Braille printed books that have depressed characters are difficult to read by means of the touch system.

Chapter XXXIV

Comparison of Processes

Type itself is an important part of every process. As yet there is no way of setting the text matter of a book by any better method than that offered by the printer. Even though the process be intaglio or offset lithography the type is set by a printer and either used for proofs for photographing or transfer to be used

COMPARISON OF PRODUCTION POSSIBILITIES OF THE THREE MOST USED PROCESSES

	Relief Letter-press	*Planographic* Offset Lithograph	*Intaglio* Rotogravure
Text type	Must set	Must set	Must set
Transfers	None	Yes, either photo or type	Yes, either photo or type on onion-skin stock
Stocks for color reproduction	Calendered or coated	Medium calendered or Machine Finish.	Machine finish or newsprint
Art work	Engravings	Negative or positive transfers	Negative and positives for carbon tissue
Reproduction of plates	Stereotype—electrotypes	None	None
Make-up form	Individual units moved to register	One unit of entire form	One unit of entire form
Preparation form or plates	Lockup time for form	Develop and treat plate for press	Etch cylinder for press
Run possibilities	Flat or rotary	Flat or rotary	Flat or rotary
Characteristics of finished product	Sharp definite detail evidence of slight impression	Soft or matt finish no impression showing	Soft or matt finish no impression showing
Time elapse between colors for handling of job	5 to 8 hours	2 to 5 hours	Immediately
Impressions from plates	Nickel electros up to one million. Chromium plated electros run over this amount	Albumen offset 50M. Deep-etch offset 250M.	Cylinder 400M. Flat plate 150M.

direct. The offset process can eliminate type setting only when the job is to be reprinted or reproduced in typewritten characters or is a reproduction of an original drawing. A comparison of the three methods of production will show certain advantages to be found in letterpress reproduction that are not found in the other processes especially on rush work. Reproduction of plates and type in electrotypes and stereotypes is one advantage. Finishing

possibilities in halftones and color process plates is another. Re-etching and burnishing will help lighten or darken certain parts of a halftone after it has been etched.

Register jobs in letterpress process show important advantages. Pages can be moved into register at any time even to the extent of cutting plates apart to secure register within the page. Sheet changes from atmospheric conditions can be provided for in this way.

An analysis chart for comparison of the production possibilities of all three processes shows the importance of each. Rush jobs should be planned for prompt delivery on the basis of these points.

Chapter xxxv

Cost and Production Analysis of Offset

Letterpress printers are concerned with the competition offered by the offset lithographic industry, and a fair estimate of this competition can be made only through the comparison of operations required to produce a job in both letterpress and offset lithography.

Composition

Jobs to be produced in offset lithography and type require the setting of type for the job. If a letterpress job is a reprint and no corrections are required, the offset lithographer will not need the printer's efforts in doing the job, as photographic reproduction of the job to be reprinted may be made direct from the sample for reprinting. When corrections are required in the composition, the job often requires resetting, and in this case the offset lithographer requires the same expenditure as the printer for typesetting requirements.

A comparison of the cost of imposition for the letterpress printer and the cost of transfers, layout sheet and sticking-up sheet and plate making operations for the lithographer can be made. As a comparison for typesetting cost as compared with lithographic cost, the approximate selling rate for camera work for the lithographer in metropolitan centers at the present time varies as follows:

Camera Work	$4.00 to $6.50 per hour
Hand Proving (when original engravings are stored in the plant)	$2.75 to $3.50 per hour
Hand Transferring	$2.75 to $3.50 per hour

The step-and-repeat machine operation for photo-composed plates varies from $4.00 to $7.00 an hour. Art work which is mostly hand operation varies from $2.75 to $3.50 per hour.

Hand Transfers

Hand transfers which are individual impressions of originals correspond to the photo-engraving originals and electrotype re-

productions in letterpress printing. These transfers are used to make up a form or press plate for the offset press. The press plate consists of a layout sheet which is the key plate for all colors contained in the job; a proof of this layout is shown on what is known as stick-up plate or board, sometimes called a tympan. This consists of an aluminum base with a manila sheet pasted down to control registration of the full sheet. The transfer impressions are pinned up on this layout, two register marks contained on each sheet. This job requires skill in order to maintain complete register, as exertion on part of the transferer in pulling the sheet off the stone may stretch the paper.

When forms are made up as photographic transfer, a step-and-repeat machine is used for photo-mechanically composed plates. The photographic transfer which is in the form of a negative is placed in the step-and-repeat machine and photographed directly on the sensitized press plate. The negative is then moved to the next position and again photographed. In this way the entire press plate is made through a micrometer adjustment. The step-and-repeat machine prints these negatives to within .001 of an inch in either direction. The negatives may be either glass film, cellophane or transparent paper.

Halftone screens are similar for letterpress or offset lithography. Offset uses screens from 120 to 150 lines to the inch. Finer or coarser screens may be used.

For color work the color separation negatives are made similarly to letterpress plates. The panchromatic or color sensitive negatives are made in continuous tone, and positives are made from these negatives. Retouching is done on positives. After color correction the positive is used for making a negative in which the screen is inserted. Negatives are then given to the platemaker who prepares the press plates for the pressroom.

Ink Consumption

Ink consumption in the offset industry is approximately 25% less for zinc, 50% less for stone, than the same form would require in the letterpress industry.

Make-ready

An average time for make-ready requirements for offset lithography for line plates is .001 of an hour per square inch plus one hour, and for halftones .002 of an hour per square inch plus one hour. The entire area of the sheet being printed must be considered in this make-ready charge as a 25x38 sheet requires atten-

tion over an entire surface regarding any picks or blemishes that may be found in the plate.

Running Time

From 2,000 to 2,500 impressions per hour is the average run for the medium and large size machines with a proportionate increase of production for machines as small as 22x34 inches.

Press Plates

Platemakers must use every precaution to insure register. The change of paper stock between colors sometimes causes havoc in the offset lithographic industry. To overcome this, the paper stock is seasoned to permit of the proper humid content which should be kept uniform during printings. Variations in paper in lithographic work produces serious problems.

Press plates are made either with an albumen base wherein the negative is printed on sensitized glue or albumen film on the plate. The arclight is used to harden the glue just as photo-engravers use it for making engravings. The albumen base is raised above the surface of the printed part of the plate and although these plates are known to stand up to 75,000 to 100,000 impressions, the rule for offset lithographers considers a run of 35,000 to 50,000 sufficient for one of these press plates. Therefore, there is a possibility that a run of 100,000 impressions in offset lithography with an albumen plate may require two or three sets of transfers or press plates for the completion of the run.

There is an intaglio deep-etched plate now being used in the offset lithography industry. The design on this plate is etched below the surface in this way protecting the work on the plate and protecting it from coming off as it sometimes does on the albumen or glue base plate.

Intaglio or deep-etched plates are known to have run over 250,000 impressions. The etched plate is approximately .001 to .002 of an inch below the surface of the plate. The cost of photo-composed plates is double the cost of albumen plates. The price list shown here gives the square inch rate for negatives or positives plus the art work for retouching.

The prices shown are for offset press plates. The basis for negatives and positives is the square inch. For photo-composed press plates the basis is the number up on a plate and not the square inch area, as register requirements are increased with each negative up regardless of the size of a negative.

The cost of offset press plates consists of negatives and press plates. Charges for zinc plates are additional to other charges as is also the charge for negative glass.

PRICE LIST

For Offset Process

Wet Plate Line Negative—3¢ per square inch (minimum charge $2.50).

Wet Plate Halftone Negative—4¢ per square inch (minimum charge $3.00).

Color separation Dry Plate Halftone Negative—8¢ per square inch (minimum charge $6.00).

Glass Process

Full Tone Dry Plate Negative—6¢ per square inch.

Positive—4¢ per square inch.

Halftone Finished Negative—8¢ per square inch.

A special price in addition to above charge will be made according to the amount of handwork necessary on positive.

A charge of 50¢ per glass if negative is furnished up to size 16x20; special price for larger glass.

Single print on metal $1.25. Special price for larger prints according to size.

Photo-Composed Plates

1 to 4 up	- -	$8.60	Double these prices for Deep-Etched Plates
5 to 7 up	- -	11.35	
8 to 10 up	- -	15.70	
11 to 14 up	- -	17.10	
15 to 18 up	- -	18.50	
19 to 22 up	- -	19.90	
23 to 26 up	- -	21.30	
27 to 30 up	- -	22.70	
31 to 34 up	- -	24.10	
35 to 38 up	- -	25.50	
39 to 42 up	- -	26.90	
43 to 46 up	- -	28.30	
47 to 50 up	- -	29.70	

25¢ for each additional step-up beyond 50.
Change of negative, 75¢ per change.

Zinc

will be charged additionally as follows:

22½x30"—.010"	- -	$1.25
25½x36"—.012"	- -	1.50
28¾x36"—.014"	- -	1.75
29 x35"—.014"	- -	1.75
31 x36"—.012"	- -	1.65
32½x43"—.012"	- -	2.25
32½x43"—.014"	- -	2.35
37 x48"—.012"	- -	2.40
38½x50"—.012"	- -	2.75
38½x50"—.014"	- -	3.00
38½x50"—.016"	- -	3.15
38½x50"—.019"	- -	3.30
44½x54"—.013"	- -	3.50
45½x54"—.016"	- -	3.60
45½x54"—.018"	- -	4.00

Kelly Automatic Cylinder Presses, Miller Automatic Cylinder Pr[illegible]ce Cylinder Presses—Specifications and Other Brief Information

KELLY AUTOMA[illegible]YLINDER PRESSES

Press Designation	Bed Bearer Height	Cyldr. Bearer Height	Cyldr. Setting Bearers off	Sheet Size Limits	Maximum Size Forms	Number of Form Rollers	Roller Coverage from Deadline	Roller Dimensions	[illegible]	Feeder	Feeder Capacity	Delivery	Delivery Capacity	Weight	Space Requirements	Electrical Specifications	Remarks
No. 2 Kelly Automatic	.916	.056	.908	8x12 to 24x35	Up to 24x35" locked on bed and covered with 1 form roller (and 1 auxiliary roller). See Remarks and Roller Coverage.	3 Standard 1 Auxiliary	3 Rollers 18⅜" 2 Rollers 21⅜" 1 Roller 24" 1 Auxiliary 24"	All Rollers 2½" Diameter	[illegible]	Built-in feeder. Can be hand fed	21½"	Ext. pile	27"	10350 lbs.	6-7"x15	Press 3 H. P.—D. C. variable speed motor, or 4 H. P.—A. C. (1 phase) variable speed motor, or 5 H. P.—A. C. (Polyphase) variable speed motor. Blower ¾ H. P. constant speed motor.	Poster Chase inside 24¾x-32¾. Book chase inside 25x33. Bearer to bearer 35½. Auxiliary inker is standard.
No. 1 Kelly Automatic	.916	.056	.908	8x12 to 22x28	Up to 22x28" locked on bed and covered with 1 form roller (and 1 auxiliary roller). See Remarks and Roller Coverage.	3 Standard 1 Auxiliary	3 Rollers 17" 2 Rollers 19¾" 1 Roller 22" 1 Auxiliary 22"	All Rollers 2¼" Diameter	[illegible]	Built-in feeder. Can be hand fed	21"	Ext. pile	25"	9235 lbs.	5-10"x13-7"	Press 3 H. P. variable speed motor. Blower ¾ H. P. constant speed motor.	Poster chase inside 22x26⅝. Bearer to bearer 28¾. Auxiliary inker is standard.
Style B Special Kelly Automatic	.916	.056	.908	7x10 to 17x22	Up to 16x22" locked on bed and covered with 1 form roller (and 1 auxiliary roller). See Remarks and Roller Coverage.	3 Standard 1 Auxiliary	3 Rollers 11½" 2 Rollers 13⅝" 1 Roller 16" 1 Auxiliary 16"	All Rollers 2" Diameter	[illegible]	Built-in feeder. Can be hand fed	12½"	Ext. Del.	Ext. Del. 30½"	4425 lbs. 4900 lbs. with Ext. Delivery	6-6"x3-6" 10-3"x3-6" with Ext. Del.	Press 1½ H. P. for D. C. and 1 Phase A. C. or 2 H. P. for A. C. (Polyphase) variable speed motor. Blower ¾ H. P. constant speed motor.	Bearer to bearer 22⅝. Early Style B models can be easily converted to the Style B Special size.
Style A Kelly Automatic	.916	.056	.908	3¼x5¼ to 13½x20	12¾x19¾" in chase.	2	2 Rollers 12¾"	All Rollers 2" Diameter	[illegible]	Built-in feeder. See remarks	12½"	Ext. Del.	Ext. Del. 30½"	4270 lbs. 4750 lbs. with Ext. Delivery	4x6-6" 4x10-3" with Ext. Del.	One motor 3 H. P. variable speed motor.	Bearer to bearer 21⅝. Press can be hand fed, but minimum speed is too great for most jobs.
Kelly Automatic Jobber	.916	.056	.908	5x8 to 13x20	12¼x19" covered with two rollers.	2	2 Rollers 12½"	All Rollers 2" Diameter	[illegible]	Built-in feeder	12½"	Ext. Del.	Ext. Del. 36"	4000 lbs. 4500 with Ext. Del.	3-10"x12 with Ext. Del.	One motor 3 H. P. variable speed motor.	

MILLER AUTOMA[illegible]YLINDER PRESSES

Press Designation	Bed Bearer Height	Cyldr. Bearer Height	Cyldr. Setting Bearers off	Sheet Size Limits	Maximum Size Forms	Number of Form Rollers	Roller Coverage from Deadline	Roller Dimensions	[illegible]	Feeder	Feeder Capacity	Delivery	Delivery Capacity	Weight	Space Requirements	Electrical Specifications	Remarks
Miller High Speed	.916	.047	.914	4x7 to 18x20	12x19" in chase 12x20" locked on bed	2	2 Rollers 12 1-16"	Form 2" Diameter All others 1½" Diameter	[illegible]	Built-in feeder. Cannot be hand fed	26"	Ext. pile	27"	4330 lbs. net	4-8"x10-2" Closed 6x11-8" open	Press 1½ H. P. variable speed motor. Pump ½ H. P. constant speed motor.	Slow sheet delivery regardless of press speed. (2 speeds).
Miller Simplex	.916	.054	.912	8½x11 to 20x26	19x24" in chase. 19 1-16x25⅛ locked on bed.	2	2 Rollers 19 1-16" and 1 auxiliary	Form & Ductor 2½" Diameter All Others 2" Diameter	[illegible]	Built-in feeder. Cannot be hand fed	37"	Ext. pile	34"	7050 lbs. net	4-5"x10-3" Closed 6-10"x11-9"opn.	Press 3 H. P. variable speed motor. Pump 1 H. P. constant speed motor.	Slow sheet delivery regardless of press speed. (2 speeds).
Miller Major Simplex	.916	.054	.910	12x15 to 27x40	25x37" in chase. 27x40" locked on bed.	3	3 Rollers 25" 2 Rollers 26½" with cylinder advanced and 1 auxiliary	All Rollers 2½" Diameter	[illegible]	Built-in feeder. Cannot be hand fed	42"	Ext. pile	34"	15000 lbs. net	6-3"x15-3" Closed 10-5"x17-4"opn.	Press 5 H. P. variable speed motor. Pump 1½ H. P. constant speed motor.	Slow sheet delivery, regardless of press speed. (2 speeds).
Miller Two-Color	.916	.054	.910	11x17 to 25x38	23½x35" in chase. 24½x37½" locked on bed.	3 for ea. form	3 Rollers 24⅛"	All Rollers 2½" Diameter	[illegible]	Built-in feeder. Cannot be hand fed	46"	Ext. pile	40"	19500 lbs. net	7-1"x17-3" Closed 10x22-4" open	Press 7½ H. P. D. C. or 10 H. P. A. C. variable speed motor. Pump 1½ H. P. constant speed motor.	Slow sheet delivery regardless of press speed. (3 speeds)

LEE HAND-F[illegible]YLINDER PRESSES

Press Designation	Bed Bearer Height	Cyldr. Bearer Height	Cyldr. Setting Bearers off	Sheet Size Limits	Maximum Size Forms	Number of Form Rollers	Roller Coverage from Deadline	Roller Dimensions	[illegible]	Feeder	Feeder Capacity	Delivery	Delivery Capacity	Weight	Space Requirements	Electrical Specifications	Remarks
Lee 2-Revolution Cylinder Press No. 38	.918	.0785		Up to 24x36	22x35"	2	2 Rollers cover full form	All Rollers 3" Diameter	[illegible]	Hand fed		Fly or face up		Fly Del. 5000 lbs. Face up 5200 lbs.	5-8"x10-1"	One motor 1½ H. P.	
Lee 2-Revolution Cylinder Press No. 42	.918	.0785		Up to 28x40	25x38"	2	2 Rollers cover full form	All Rollers 3" Diameter	[illegible]	Hand fed		Face up only		7000 lbs.	6-5"x11-2"	One motor 2 H. P.	

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MIEHLE PRESSES—Specifications and Other Brief Information

Press Designation	Bed Bearer Height	Cylndr. Bearer Height	Cylndr. Setting. Bearers off	Sheet Size Limits	Maximum Size Forms	Number of Form Rollers	Roller Coverage From Deadline	Roller Dimensions	Speed Range	Feeder	Feeder Capacity	Delivery	Delivery Capacity	Approximate Weight	Space Requirements	Electrical Specifications
Miehle Flatbed Pony (34½")	.9167	.070	.911	Up to 22½x34	21x30½ In Chase	2	2 Rollers 21"	Form 3"x34" All others 2"x34"	1425 to 2850	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 37"	10500 lbs.	6-7"x9-7"	3 H. P. Variable Speed Motor
Miehle Flatbed No. 4-2R (40")	.9167	.067	.911	Up to 25½x39½	24x37 In Chase	2	2 Rollers 24"	Form 3¼"x40" Riders 2½"x[illegible] Others 2½"x39½"	1300 to 2600	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 29¾"	10500 lbs.	7-8"x11-1"	3 H. P. Variable Speed Motor
Miehle Flatbed No. 3½-2R (42⅛")	.9167	.070	.907	Up to 27½x41½	26x38 In Chase	2	2 Rollers 26"	Form 3½"x41½" Others 2½"x41½"	1250 to 2500	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 32"	11750 lbs.	7-9"x11-10"	3 H. P. Variable Speed Motor
Miehle Flatbed No. 1-2R (53")	.9167	.070	.907	Up to 35½x52½	34x49 In Chase	2	2 Rollers 34"	All Rollers 2½"x52½"	1100 to 2200	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 31¼"	16400 lbs.	8-10"x13-8"	5 H. P. Variable Speed Motor
Miehle Flatbed No. 4-3R (42⅛")	.9167	.070	.911	Up to 26½x41½	24x38 In Chase	3	3 Rollers 24"	Form & Riders 3"x41½" Others 2½"x41½"	1250 to 2500	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 32"	11850 lbs.	7-9"x11-10"	3 H. P. Variable Speed Motor
Miehle Flatbed No. 41 (41")	.9167**	.070	.909	Up to 28x40½	24x37 In Chase	4	4 Rollers 24" 3 Rollers 27"	Form & Riders 3"x40½" Others 2½"x40½"	1500 to 3000	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 30½"	15500 lbs.	8-5"x12-4¾"	Press 5 H. P. Variable Speed Motor. Del. 1 H. P. Constant Speed Motor
Miehle Flatbed No. 3 (46")	.9167	.070	.907	Up to 31x45½	28x42 In Chase	4	4 Rollers 28" 3 Rollers 29½"	Form & Riders 3¼"x45½" Others 2½"x45½"	1125 to 2250	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 33"	16900 lbs.	8-9"x13-4"	4 H. P. Variable Speed Motor
Miehle Flatbed No. 46 (46")	.9167**	.070	.907	Up to 32x45½	29x42 In Chase	4	4 Rollers 29" 3 Rollers 31"	Form & Riders 3¼"x46½" Others 2½"x[illegible]	Up to 2800	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 33¼"	18700 lbs.	8-10¾"x14-3"	Press 7½ H. P. Variable Speed Motor. Del. 1 H. P. Constant Speed Motor
Miehle Flatbed No. 2 (50")	.9167	.070	.907	Up to 34x49½	30½x46 In Chase	4	4 Rollers 30½" 3 Rollers 32½"	Form & Riders 3¼"x49½" Others 2½"x[illegible]	1050 to 2100	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 33"	17650 lbs.	9-11"x13-10"	5 H. P. Variable Speed Motor
Miehle Flatbed No. 1 (53")	.9167	.070	.907	Up to 38x52½	34½x49 In Chase	4	4 Rollers 34½" 3 Rollers 36½"	Form & Riders 3¼"x52½" Others 2½"x[illegible]	975 to 1950	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 34½"	19300 lbs.	9-4"x14-10"	5 H. P. Variable Speed Motor
Miehle Flatbed No. 2-0 (56")	.9167	.070	.910	Up to 41½x55½	38x52 In Chase	4	4 Rollers 38" 3 Rollers 40"	Form & Riders 3½"x55½" Others 3"x[illegible]	925 to 1850	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 37½"	22100 lbs.	9-8"x15-10"	5 H. P. Variable Speed Motor
Miehle Flatbed No. 4-0 (62")	.9167	.070	.907	Up to 46x61½	41x58 In Chase	4	4 Rollers 41" 3 Rollers 44"	Form & Riders 3½"x61½" Others 3"x61½"	875 to 1750	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 39"	24400 lbs.	10-2"x16-5"	5 H. P. Variable Speed Motor
Miehle Flatbed No. 5-0 (65")	.9167	.070	.907	Up to 46x64½	41x61 In Chase	4	4 Rollers 41" 3 Rollers 44"	Form & Riders 3½"x64½" Others 3"x64½"	875 to 1750	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 39"	25000 lbs.	10-5"x16-5"	7½ H. P. Variable Speed Motor
Miehle Flatbed No. 5-0 Special (68")	.9167	.070	.907	Up to 46x67½	41x64 In Chase	4	4 Rollers 41" 3 Rollers 44"	Form & Riders 3½"x67½" Others 3"x67½"	875 to 1750	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 39"	26000 lbs.	10-8"x16-5"	7½ H. P. Variable Speed Motor
Miehle Flatbed No. 6-0 (68")	.9167	.070	.907	Up to 50x67½	45½x64 In Chase	4	4 Rollers 45½" 3 Rollers 48½"	Form & Riders 3¾"x67½" Others 3"x67½"	800 to 1600	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 41"	32500 lbs.	10-10"x17-8"	7½ H. P. Variable Speed Motor
Miehle Flatbed No. 7-0 (74")	.9167	.070	.907	Up to 50x73½	45½x70 In Chase	4	4 Rollers 45½" 3 Rollers 48½"	Form & Riders 3¾"x73½" Others 3"x73½"	800 to 1600	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 41"	33000 lbs.	11-4"x17-8"	7½ H. P. Variable Speed Motor
Miehle Vertical	.9167	.050	.9145	***3¼x5½ to 13½x20	12¼x19	2	2 Rollers 12¼"	All Rollers 2"x20"	2500 to 4500‡	Part of standard unit. Hand feeding not practical	12"	Part of standard unit	12"	2800 lbs.	4-8"x6-10" Open Position	3 H. P. Constant Speed Motor

*—The Horizontal Two-Color is two Horizontals in tandem with one feeder and one delivery.

**—The Miehle Horizontal and flatbeds, Nos. 41, 46, 41 T. C., and 46 T. C., formerly had bed bearers .914" high. The .9167" bearer height began with the following serial numbers on the different presses: Miehle Horizontal, serial H-1283; No. 41, serial 19466; No. 41 T. C., serial 19387; No. 46, serial 19535; No. 46 T. C., serial 19492. Presses having .914" high bed bearers can be set approximately .003" less than specified for bearers .9167" high.

***—Early models 12¼x19 maximum.

‡—Early models 2000 to 3600

†—4 to 6 feet more on all automatic units for extension delivery.

MIEHLE PRESSES—Specifications and Other Brief Information

Miehle Horizontal *	.9167**	.060	.9125	8½x11 to 22x28	19¾x26 In Chase	2	2 Rollers 19¾"	2 Rollers 2¾"x27⅝" Others 2¼"x27⅝"	1000 to 3600	Part of standard unit. Hand feeding not practical	21"	Part of standard unit	34"	9000 lbs.	8-10"x14-8" Open Position	5 H. P. Constant Speed Motor
Miehle Flatbed Automatic Unit Pony (34½")	.9167	.070	.911	11x17 to 22½x34	21x30½ In Chase	2	2 Rollers 21"	Form 3"x34" Others 2"x34"	1425 to 2850	Part of standard unit. Can be hand fed.	30"	Ext. Del. can be attached	Standard 3" Pile Del. 27"	11500 lbs.	†7-8"x14-6" Open Position	Press: 3 H. P. Variable Speed Motor: Feeder: 1 H. P. Constant Speed Motor
Miehle Flatbed Automatic Unit No. 4-2R (40")	.9167	.067	.911	11x17 to 25½x39½	24x37 In Chase	2	2 Rollers 24"	Form 3¼"x40" Riders 2½"x40" Others 2½"x39¼"	1300 to 2600	Part of standard unit. Can be hand fed.	30"	Ext. Del. can be attached	Standard 3" Pile Del. 29¾"	14500 lbs.	†9x15-5" Open Position	Press 3 H. P. Variable Speed Motor: Feeder: 1 H. P. Constant Speed Motor
Miehle Flatbed Automatic Unit No. 4-3R (42⅛")	.9167	.070	.911	11x17 to 26½x41½	24x38 In Chase	3	3 Rollers 24"	Form & Riders 3"x41⅝" Others 2½"x41⅝"	1250 to 2500	Part of standard unit. Can be hand fed	30"	Ext. Del. can be attached	Standard 3" Pile Del. 32"	15500 lbs.	†8-9"x17-1" Open Position	Press: 3 H. P. Variable Speed Motor: Feeder: 1 H. P. Constant Speed Motor
Miehle Flatbed Automatic Unit No. 41 (41")	.9167**	.070	.909	11x17 to 28x40½	24x37 In Chase	4	4 Rollers 24" 3 Rollers 27"	Form & Riders 3"x40½" Others 2½"x40½"	1500 to 3000	Part of standard unit. Can be hand fed	52"	Ext. Del. can be attached	Standard 3" Pile Del. 29½"	19000 lbs.	†8-7"x17-10½"	Press: 5 H. P. Variable Speed Motor; Feeder: 1½ H. P. Constant Speed Motor; Del. 1 H. P. Constant Speed Motor
Miehle Flatbed Automatic Unit 41 T. C. (41")	.9167**	.070	.909	11x17 to 27x40½	24x37	4 for each form	4 Rollers 24" 3 Rollers 24¾"	Form & Riders 3"x40½" Others 2½"x40½"	1600 to 2800	Part of standard unit. Can be hand fed.	54"	Ext. Del. can be attached	Standard 3" Pile Del. 33½"	31930 lbs.	†9-5 11-16"x23 11-16"	Press 10 H. P. Variable Speed Motor: Feeder 1½ H P. Constant Speed Motor; Del. 1 H. P. Constant Speed Motor
Miehle Flatbed Automatic Unit No. 46 (46")	.9167**	.070	.907	16x19 to 32x45½	29x42 In Chase	4	4 Rollers 29" 3 Rollers 31"	Form & Riders 3¼"x45½" Others 2½"x45½"	1400 to 2800	Part of standard unit. Can be hand fed	56"	Ext. Del. can be attached	Standard 3" Pile Del. 31¾"	23500 lbs.	†8-10¾"x19-6	Press 7½ H. P. Variable Speed Motor: Feeder: 1½ H. P. Constant Speed Motor; Del. 1 H. P. Constant Speed Motor
Miehle Flatbed Automatic Unit No. 46 T. C. (46")	.9167**	.070	.907	16x19 to 32x45½	29x42 In Chase	4 for each form	4 Rollers 29" Same on both beds	Form & Riders 3"x45½" Others 2½"x45½"	1400 to 2800	Part of standard unit. Can be hand fed	56"	Ext. Del. can be attached	Standard 3" Pile Del. 38"	40500 lbs.	†9-10¼"x26-3"	Press: 15 H. P. Variable Speed Motor; Feeder: 1½ H. P. Constant Speed Motor; Del. 1 H. P. Constant Speed Motor
Miehle Flatbed Automatic Unit No. 56 (56¼")	.9167	.070	.907	19x25 to 41½x56	38x52½	4	4 Rollers 38" 3 Rollers 40"	Form & Riders 3½"x56" Others 3"x56¼"	1350 to 2250	Part of standard unit. Can be hand fed.	62"	Ext. Del. can be attached	Standard 3" Pile Del. 39"	30499 lbs.	† 10-5 7-16"x25-5 11-16"	Press 10 H. P. Variable Speed Motor; Feeder 1½ H. P. Constant Speed Motor; Del. 1 H. P. Constant Speed Motor
Miehle Flatbed 0 Two Color (56")	.9167	.070	.907	Up to 38x55½	36½x51 In Chase	4 for each form	4 Rollers 36½" Same on both beds	Form & Riders 3¼"x55½" Others 3"x55½"	850 to 1700	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 39½"	39200 lbs.	10-2"x20-5"	10 H. P. Variable Speed Motor
Miehle Flatbed 3-0 Two Color (62")	.9167	.070	.907	Up to 40½x61½	40x57 In Chase	4 for each form	4 Rollers 40" Same on both beds	Form & Riders 3¼"x61½" Others 3"x61½"	800 to 1600	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 40½"	44300 lbs.	10-8"x21-5"	10 H. P. Variable Speed Motor
Miehle Flatbed 5-0 Two Color (65")	.9167	.070	.907	Up to 46¼x64½	46x60 In Chase	4 for each form	4 Rollers 46" Same on both beds	Form & Riders 3½"x64½" Others 3"x64½"	750 to 1500	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 43¾"	50000 lbs.	11x33-3"	15 H. P. Variable Speed Motor
Miehle Flatbed 6-0 Two Color (70")	.9167	.070	.907	Up to 46¼x69½	46x65 In Chase	4 for each form	4 Rollers 46" Same on both beds	Form & Riders 3½"x69½" Others 3"x69½"	750 to 1500	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 43¾"	54300 lbs.	11-5"x33-3"	15 H. P. Variable Speed Motor
Miehle Flatbed No. 1 Perfector (53")	.9167	1st Cyl. .070 2nd Cyl. .078	.907	Up to 37x52½	35x48 In Chase	4 for each form	4 Rollers 35" Same on both beds	Form & Riders 3¼"x52½" Others 3"x52" Oil Feed Roller 3"x52½"	950 to 1900	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 36¾"	36600 lbs.	10-3"x18-11"	10 H. P. Variable Speed Motor
Miehle Flatbed No. 2-0 Perfector (56")	.9167	1st Cyl. .070 2nd Cyl. .078	.907	Up to 40x55½	38x51 In Chase	4 for each form	4 Rollers 38" Same on both beds	Form & Riders 3¼"x55½" Others 3"x55½" Oil Feed Roller 3"x55½"	900 to 1800	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 36¾"	39850 lbs.	10-5"x20-2"	10 H. P. Variable Speed Motor
Miehle Flatbed No. 5-0 Perfector (69")	.9167	1st Cyl. .070 2nd Cyl. .078	.907	Up to 45x68½	42½x64 In Chase	4 for each form	4 Rollers 42½" Same on both beds	Form & Riders 3½"x68½" Others 3"x68" Oil Feed Roller 3"x68¾"	800 to 1600	Hand fed. Feeder can be attached		Ext. Del. can be attached	Standard 3" Pile Del. 40¾"	50550 lbs.	11-7"x22-4"	15 H. P. Variable Speed Motor
Miehle Flatbed Rear Delivery No. 1A (53")	.9167	.109	.909	Up to 35½x52½	34x49 In Chase	2	2 Rollers 34"	Form 3½"x52½" Rider & Ductor 3"x52½"	1100 to 2200	Hand fed only		Fly Del. at back of press		15700 lbs.	8-10"x13-7"	5 H. P. Variable Speed Motor
Miehle Flatbed Rear Delivery No. 2-0A (56")	.9167	.109	.909	Up to 39½x55½	38x52 In Chase	2	2 Rollers 38"	Form 3½"x55½" Rider & Ductor 3"x55½"	1000 to 2000	Hand fed only		Fly Del. at back of press		18000 lbs.	9-1"x15-9"	5 H. P. Variable Speed Motor

*—The Horizontal Two-Color is two Horizontals in tandem with one feeder and one delivery.

**—The Miehle Horizontal and flatbeds, Nos. 41, 46, 41 T. C., and 46 T. C., formerly had bed bearers .914" high. The .9167" bearer height began with the following serial numbers on the different presses: Miehle Horizontal, serial H-1283; No. 41, serial 19466; No. 41 T. C., serial 19387; No. 46, serial 19535; No. 46 T. C., serial 19492. Presses having .914" high bed bearers can be set approximately .003" less than specified for bearers .9167" high.

***—Early models 12½x19 maximum.

‡—Early models 2000 to 3600

†—4 to 6 feet more on all automatic units for extension delivery.

BABCOCK PRESSES—Specifications and Other Brief Information

Press Designation	Bed Bearer Height	Cylndr. Bearer Height	Cylinder Setting. Bearers off	Sheet Size Limits	Maximum Size Forms	Number of Form Rollers	Roller Coverage From Deadline	Roller Dimensions	Speed Range	Feeder	Feeder Capacity	Delivery	Delivery Capacity	Weight	Space Requirements	Electrical Specifications	REMARKS
The Babcock No. 3-5 Automatic	.918	.055	.910-.912	11x17 to 24½x35 5½x8½ if hand fed	21x32 in chase 21x33 locked on bed	2	2 Rollers 21½" 1 Roller 22¾"	Form 3"x34" Others 2"x34"	Up to 3000 I.P.H.	Dexter C. P. Pile Can be hand fed	28"	Ext. Pile	28"	10800 lbs. boxed	7-6"x18-3" 7-6"x15-5" Without ext. del.	3 H. P. 5.68 Rev. of pulley shaft per imp.	Slitter and perforator
The Babcock No. 4-3 Automatic	.918	.055	.910-.912	11x17 to 26x40 5½x8½ if hand fed	24x37 in chase 24x38 locked on bed	3	3 Rollers 24" 2 Rollers 24¾"	3"x39" All Rollers	Up to 2500 I.P.H.	Dexter C. P. Pile Can be hand fed	28"	Ext. Pile	30"	12200 lbs. boxed	7-11"x18-8" 7-11"x15-8" Without ext. del.	3 H. P. 6 Rev. of pulley shaft per imp.	Slitter and perforator Automatic fountain trip
The Babcock No. 5 Automatic	.918	.055	.910-.912	11x17 to 28½x41½ 5½x8½ if hand fed	24½x39 in chase 24½x40 locked on bed	4	4 Rollers 24¾" 3 Rollers 26⅝"	3"x41" All Rollers	Up to 2400 I.P.H.	Dexter C. P. Pile Can be hand fed	28"	Ext. Pile	30"	17000 lbs. boxed	9x19-3" 9x15-9" Without ext. del.	5 H. P. 7.5 Rev. of pulley shaft per imp.	Slitter and perforator Fountain trip
The Babcock No. 3-5 Optimus	.918	.055	.910-.912	5½x8½ to 24½x35	21x32 in chase 21x33 locked on bed	2	2 Rollers 21½" 1 Roller 22¾"	Form 3"x34" Others 2"x34"	Up to 3000 I.P.H.	Hand fed Feeder can be attached		Ext. Del. can be attached	with Ext. Del. 28"	9000 lbs. boxed	7-6"x10-9" 7-6"x13-7" With ext. del.	3 H. P. 5.68 Rev. of pulley shaft per imp.	Slitter and perforator
The Babcock No. 4-3 Optimus	.918	.055	.910-.912	5½x8½ to 26x40	24x37 in chase 24x38 locked on bed	3	3 Rollers 24" 2 Rollers 24¾"	3"x39" All Rollers	Up to 2500 I.P.H.	Hand fed Feeder can be attached		Ext. Del. can be attached	with Ext. Del. 30"	11500 lbs. boxed	7-11"x11-1" 7-11"x13-11" With ext. del.	3 H. P. 6 Rev. of pulley shaft per imp.	Slitter and perforator Interchangeable rollers Fountain trip
The Babcock No. 5 Optimus	.918	.055	.910-.912	5½x8½ to 28½x41½	24½x39 in chase 24½x40 locked on bed	4	4 Rollers 24¾" 3 Rollers 26⅝"	3"x41" All Rollers	Up to 2400 I.P.H.	Hand fed Feeder can be attached		Ext. Del. can be attached	with Ext. Del. 30"	16000 lbs. boxed	9-2"x11-1" 9-2"x14-8" With ext. del.	5 H. P. 7.5 Rev. of pulley shaft per imp.	Slitter and perforator Interchangeable rollers Fountain trip Adjustable vibration
The Babcock No. 6 Optimus	.918	.055	.909-.911	5½x8½ to 32x45½	29x43 in chase 29x44 locked on bed	4	4 Rollers 29" 3 Rollers 30½"	3"x45" All Rollers	Up to 2100 I.P.H.	Hand fed Feeder can be attached		Ext. Del. can be attached	with Ext. Del. 36"	18500 lbs. boxed	9-9"x12-4" 9-9"x16-1" With ext. del.	5 H. P. 8 Rev. of pulley shaft per imp.	Slitter and perforator Interchangeable rollers Foutain trip Adjustable vibration
The Babcock No. 7 Optimus	.918	.055	.909-.911	5½x8½ to 35x50½	31x48 in chase 31x49 locked on bed	4	4 Rollers 31½" 3 Rollers 33¼"	3½"x50" All Rollers	Up to 2000 I.P.H.	Hand fed Feeder can be attached		Ext. Del. can be attached	with Ext. Del. 40"	21000 lbs. boxed	10-2"x13-7" 10-2"x17-5" With ext. del.	5 H. P. 9 Rev. of pulley shaft per imp.	Slitter and perforator Interchangeable rollers Foutain trip Adjustable vibration
The Babcock No. 10 Optimus	.918	.055	.908-.910	5½x8½ to 39½x54	37x51 in chase 37x52 locked on bed	4	4 Rollers 37" 3 Rollers 38"	3½"x53" All Rollers	Up to 1800 I.P.H.	Hand fed Feeder can be attached		Ext. Del. can be attached	with Ext. Del. 40"	23000 lbs. boxed	10-5"x15-3" 10-5"x19-7" With ext. del.	7½ H. P. 9.9 Rev. of pulley shaft per imp.	Slitter and perforator Interchangeable rollers Foutain trip Adjustable vibration
The Babcock No. 11 Optimus	.918	.055	.908-.910	5½x8½ to 43x61½	40x59 in chase 40x60 locked on bed	4	4 Rollers 40" 3 Rollers 41¼"	3½"x61" All Rollers	Up to 1700 I.P.H.	Hand fed Feeder can be attached		Ext. Del. can be attached	with Ext. Del. 40"	25000 lbs. boxed	11-1"x16-0" 11-1"x20-8" With ext. del.	7½ H. P. 10 Rev. of pulley shaft per imp.	Slitter and perforator Interchangeable rollers Foutain trip Adjustable vibration
The Babcock No. 12-4 Optimus	.918	.055	.908-.912	5½x8½ to 45½x64½	42x62 in chase 42x63 locked on bed	4	4 Rollers 42¼" 3 Rollers 43¾"	3½"x64" All Rollers	Up to 1700 I.P.H.	Hand fed Feeder can be attached		Ext. Del. can be attached	with Ext. Del. 40"	26500 lbs. boxed	11-4"x16-10" 11-4"x21-10" With ext. del.	7½ H. P. 10.57 Rev. of pulley shaft per imp.	Slitter and perforator Interchangeable rollers Foutain trip Adjustable vibration
The Babcock No. 4 Standard—Single Revolution Press	.918	.055	.911-.915	5½x8½ to 25x38	23x36 in chase 23x37 locked on bed	2	2 Rollers 23½"	3"x38"	Up to 2200 I.P.H.	Hand fed Feeder sometimes attached		Fly		9000 lbs. boxed	10-11"x8-0"	1½ H. P. 5 Rev. of pulley shaft per imp.	Built for small newspapers, posters, broadsides, etc.
The Babcock No. 6 Standard—Single Revolution Press	.918	.055	.911-.915	5½x8½ to 30½x46	28½x44 in chase 28½x45 locked on bed	2	2 Rollers 29"	3"x46"	Up to 1800 I.P.H.	Hand Fed Feeder sometimes attached		Fly		10500 lbs. boxed	12-4"x8-8"	2 H. P. 5 Rev. of pulley shaft per imp.	Built for small newspapers, posters, broadsides, etc.
The Babcock No. 7 Standard—Single Revolution Press	.918	.055	.911-.915	5½x8½ to 35x49	33x47 in chase 33x49 locked on bed	2	2 Rollers 33½"	3"x50"	Up to 1700 I.P.H.	Hand Fed Feeder sometimes attached		Fly		12500 lbs. boxed	14-0"x9-0"	3 H. P. 5 Rev. of pulley shaft per imp.	Built for small newspapers, posters, broadsides, etc.
The Babcock No. 6 Reliance—Single Revolution Press	.918	.078	.912-.915	8½x11 to 30½x44½	28½x42½ in chase 28½x43 locked on bed	2	2 Rollers 26½" 1 Roller 29¼"	3"x44"	Up to 1500 I.P.H.	Hand Fed Feeder sometimes attached		Fly		8700 lbs. boxed	11-4"x8-4"	2 H. P. 5 Rev. of pulley shaft per imp.	Built especially for the country newspaper and job work in such plants
The Babcock No. 7 Automatic Piling Cutter and Creaser	Varies according to rule	.130	Variable .008-.012 below bed bearers	Up to 35x51¾	33½x47 in chase 33½x51 locked on bed	None			Up to 2000 I.P.H.	Hand fed or Feeder can be attached		Ext. Del. can be attached	with Ext. Del. 40"	20000 lbs. boxed	10-2"x14-4" 10-2"x17-7" With ext. del.	5 H. P. 9 Rev. of pulley shaft per imp.	Height of bearer and set of cylinder varies with height of rule
The Babcock No. 12 Automatic Piling Cutter and Creaser	Varies according to rule	.130	Variable .008-.012 below bed bearers	Up to 45½x65¾	44x60 in chase 44x65 locked on bed	None			Up to 1700 I.P.H.	Hand fed or Feeder can be attached		Ext. Del. can be attached	with Ext. Del. 40"	25500 lbs. boxed	11-4"x17-7" 11-4"x22-0" With ext. del.	7½ H. P. 10.57 Rev. of pulley shaft per imp.	Height of bearers and set of cylinder varies with height of rule
The Babcock No. 15 Automatic Piling Cutter and Creaser	Varies according to rule	.155	Variable .008-.012 below bed bearers	Up to 52½x76¾	49½x71 in chase 49½x76 locked on bed	None			Up to 1500 I.P.H.	Hand fed or Feeder can be attached		Ext. Pile	40"	37000 lbs. boxed	12-4"x22-3"	7½ H. P. 12 Rev. of pulley shaft per imp.	Height of bearer and set of cylinder varies with height of rule
The Babcock No. 272 Two-Color Sheet-Fed Rotary	Plate Cylinder .194	.055	See Remarks at right	25x38 to 50x72	48⅛x70	4 for ea. Form		4"x71¼" All Rollers	Up to 2200 I.P.H.	Hand fed or Feeder can be attached		Ext. Pile	40"	54000 lbs. boxed	12-2"x32-9" Dexter Feeder 13-11"x30-5" Cross Feeder	15 H. P. 7.714 Rev. of pulley shaft per imp.	With plates bearer height and packing .012 above, set to cut out light between bearers. Diameter of cylinder 22½" "Wesel Final" plate mounting. Plate bevel 47 degrees. Hook bevel 45 degrees. All rollers interchangeable

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Chandler and Price Platen Presses—Specifications and Other Brief Information

Press Designation	Size of Chase Inside	Size of Platen	Rollers Cov'g. Max. Form	Other Comp. Rollers	Comp. Roller Dimns.	Metal Dist'rs.	Ink Disc or Plate	Roller Adjustment	Fountain	Platen Adjust. Range	Platen Adjustment Means	Speed Range	Feeder	Feeder Sheet Size Limits	Feeder Capacity	Delivery Capacity	Weight	Space Requirements	Press will pass through	Electrical Recommendations	REMARKS
Chandler & Price New Series Press 8x12	8x12	9½x14⅞	3		1½" All Rollers	1 (Extra Equipment) 1⅛"x12⅛"	Single Disc 13¾ Diameter	None	12 15-16" wide	¼"	4 Screws	Up to [illegible]000	Hand fed. Peerless Feeder can be attached				1050 lbs. not crated	40½"x48"	36" width 18" stripped	¼ H.P. Motor variable speed control	Electric equipment is extra. Special fountains, chases, roller trucks, distributor, etc., are extra.
Chandler & Price New Series Press 10x15	10x15	11¼x18⅛	3		1¾" All Rollers	1 (Extra Equipment) 1⅛"x15⅛"	Single Disc 17¼ Diameter	None	16 7-16" wide	3-16"	4 Screws	Up to [illegible]700	Hand fed. Feeder can be attached				1500 lbs. not crated	47"x55"	43" width 21½" stripped	½ H.P. Motor variable speed control	Electric equipment is extra. Special fountains, chases, roller trucks, distributor, etc., are extra.
Chandler & Price New Series Press 12x18	12x18	13⅛x21¾	3		2" All Rollers	1 (Extra Equipment) 1⅛"x18"	Single Disc 20 5-16 Diameter	None	19 17-32" wide	¼"	4 Screws	Up to [illegible]500	Hand fed. Feeder can be attached				2100 lbs. not crated	55½"x60"	46" width 25¼" stripped	½ H.P. Motor variable speed control	Electric equipment is extra. Special fountains, chases, roller trucks, vibrator, etc., are extra.
Chandler & Price New Series Press 14½x22	14½x22	15 3-16x25⅞	4		2" All Rollers	2 (Extra Equipment) 1⅛"x22⅛"	Single Disc 24¼ Diameter	Roller tracks adjustable	23⅜" wide	5-16"	5 Screws	Up to [illegible]800	Hand fed only				2700 lbs. not crated	62½"x67"	51" width 29¼" stripped	1 H.P. Motor variable speed control	Electric equipment is extra. Special fountains, chases, roller trucks, distributor, etc., are extra.
Chandler & Price Craftsman Press 10x15	10x15	11¼x18⅛	4		1¾" All Rollers	2 15-16"x15⅛"	Reversible Disc 17¼ Diameter	Roller tracks adjustable	16 7-16" wide	3-32"	Hand wheel no screws	Up to [illegible]500	Feeder is standard. Can be hand fed	Up to 11x15½	15"	3¾"	3750 lbs. with feeder	50"x65"	47" width can be stripped	1½ H.P. Motor variable speed control	Complete electric equipment supplied. Two-up feeding attachment is extra.
Chandler & Price Craftsman Press 12x18	12x18	13 3-16x21¾	4		Form 2" Fount. 1¾"	2 15-16"x18"	Reversible Disc 20 5-16 Diameter	Roller tracks adjustable	Vibrating brayer. Fountain 18 3-16" wide	3-32"	Hand wheel no screws	Up to [illegible]000	Feeder is standard. Can be hand fed	Up to 13x19	14¼"	3¾"	2950 lbs. with feeder	45"x60" with feeder	48½" width can be stripped	1½ H.P. Motor variable speed control	Complete electric equipment supplied. Two-up feeding attachment is extra.
Chandler & Price Craftsman Press 14½x22	14½x22	15 3-16x25⅞	4		Form 2" Fount. 1¾"	2 15-16"x22"	Single Disc 24½ Diameter	Roller tracks adjustable	Vibrating brayer. Fountain 22½" wide	5-16"	5 Screws	Up to [illegible]600	Feeder is standard. Can be hand fed	Up to 16x23¼	12"	12"	3925 lbs. with feeder	62"x75"	52½" width 34" stripped	1½ H.P. Motor variable speed control	Electric equipment is extra. Numerous special feeding attachments are available but are extra. Inker optional.
Chandler & Price Heavy Duty Craftsman Press 14½x22	14½x22	15 3-16x25⅞	4		Form 2" Fount. 1¾"	2 15-16"x22"	Single Disc 24½ Diameter	Roller tracks adjustable	Vibrating brayer. Fountain 22½" wide	5-16"	5 Screws	Up to [illegible]300	Feeder is standard. Can be hand fed	Up to 16x23¼	12"	12"	4825 lbs.	62"x75"	52½" width 34" stripped	2 H.P. Motor variable speed control	Electric equipment is extra. Suitable for embossing, cutting, creasing and other work too heavy for weaker platens. Inker optional.
Chandler & Price Craftsman Press 10x15	10x15	11¼x18⅛	4		1¾"	2 15-16"x15⅛"	Single Disc 17¼ Diameter	Roller tracks adjustable	16 7-16" wide	3-16"	5 Screws	Up to [illegible]500	Press is hand fed. Feeder can be attached				1800 lbs. Not crated	44"x58"	43" width Stripped 24"	½ H.P. Motor Variable Speed Control	Electrical equipment is extra
Chandler & Price Craftsman Press 10x15	10x15	11¼x18⅛	4		1¾"	2 15-16"x15⅛"	Reversible Disc 17¼ Diameter	Roller tracks adjustable	16 7-16" wide	3-32"	Hand wheel no screws	Up to [illegible]500	Press is hand fed. Feeder can be attached				2230 lbs.	46"x58"	47" width can be stripped	¾ H.P. Motor Variable Speed Control	Electrical equipment is extra
Chandler & Price Craftsman Press 12x18	12x18	13⅛x21¾	4		Form 2" Fount. 1¾"	2 15-16"x18"	Single Disc 20 5-16 Diameter	Roller tracks adjustable	Vibrating brayer. Fountain 18 3-16" wide	¼"	5 Screws	Up to [illegible]000	Press is hand fed. Feeder can be attached				2500 lbs. Not crated	55½"x60"	48½" width Stripped 28"	1 H.P. Motor Variable Speed Control	Electrical equipment is extra
Chandler & Price Craftsman Press 12x18	12x18	13 3-16x21¾	4		Form 2" Fount. 1¾"	2 15-16"x18"	Reversible Disc 20 5-16 Diameter	Roller tracks adjustable	Vibrating brayer. Fountain 18 3-16" wide	3-32"	Hand wheel no screws	Up to [illegible]000	Press is hand fed. Feeder can be attached				3050 lbs.	48"x60"	49" width can be stripped	1 H.P. Motor Variable Speed Control	Electrical equipment is extra
Chandler & Price Craftsman Press 14½x22	14½x22	15 3-16x25⅞	4		Form 2" Fount. 1¾"	2 15-16"x22"	Single Disc 24½ Diameter	Roller tracks adjustable	Vibrating brayer. Fountain 22½" wide	5-16"	5 Screws	Up to [illegible]600	Press is hand fed. Feeder can be attached				3075 lbs. Not crated	62"x75"	52½" width Stripped 34"	1 H.P. Motor Variable Speed Control	Electrical equipment is extra Inker optional.
Chandler & Price Heavy Duty Craftsman Press 14½x22	14½x22	15 3-16x25⅞	4		Form 2" Fount. 1¾"	2 15-16"x22"	Single Disc 24½ Diameter	Roller tracks adjustable	Vibrating brayer. Fountain 22½" wide	5-16"	5 Screws	Up to [illegible]300	Press is hand fed. Feeder can be attached				3800 lbs. Not crated	62"x75"	52½" width can be stripped	1½ H.P. Motor Variable Speed Control	Electrical equipment is extra Inker optional.

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Kluge Platen Presses and Feeders; Miller Platen Press and Thomson-National Presses—Specifications and Other Brief Information

KLUGE PLATEN PRESSES AND FEEDERS

Press Designation	Size of Chase Inside	Size of Platen	Rollers Cov'g. Max. Form	Other Comp. Rollers	Comp. Roller Dimns.	Metal Dist'rs.	Ink Disc or Plate	Roller Adjustment	Fountain	Platen Adjust. Range	Platen Adjustment Means	Feeder	Feeder Sheet Size Limits	Feeder Capacity	Delivery Capacity	Weight	Space Requirements	Press will pass through	Electrical Recommendations	REMARKS
Kluge Platen Press 10x15	Skeleton 11x16	11⅛x18	4	2 distrs.	1¾" Diam. All Rollers	3 1" Diameter	Disc* 16¾ Diameter	2 sizes of trucks. Adjustable vibrators	15" wide*	½"	5 Screws	Press is hand fed. Feeder can be attached	Up to 12x15			1900 lbs.	47"x69"	42" width 63½" height	¾ H.P. Motor variable speed control	Electric equipment is extra.
Kluge Platen Press 12x18	13x19	13⅛x21¾	4	2 distrs.	2" Diam. All Rollers	3 1" Diameter	Disc* 20 Diameter	2 sizes of trucks. Adjustable vibrators	18½" wide*	½"	5 Screws	Press is hand fed. Feeder can be attached	Up to 14x18½			2785 lbs.	60"x83"	55" width 67½" height	¾ H.P. Motor variable speed control	Electric equipment is extra.
Kluge Automatic Platen Press 10x15	Skeleton 11x16	11⅛x18	4	2 distrs.	1¾" Diam. All Rollers	3 1" Diameter	Disc* 16¾ Diameter	2 sizes of trucks. Adjustable vibrators	15" wide*	½"	5 Screws	Feeder is standard. Can be hand fed	Up to 12x15	8½"	12"	2800 lbs.	47"x69"	42" width 63½" height	1¼ H.P. Motor variable speed control	Electric equipment supplied. Die-cut envelope, carton and multiple-up feeder attachments extra.
Kluge Automatic Platen Press 12x18	Skeleton 13x19	13⅛x21¾	4	2 distrs.	2" Diam. All Rollers	3 1" Diameter	Disc* 20 Diameter	2 sizes of trucks. Adjustable vibrators	18½" wide*	½"	5 Screws	Feeder is standard. Can be hand fed	Up to 14x18½	8½"	12"	3750 lbs.	60"x83"	55" width 67½" height	1¼ H.P. Motor variable speed control	Electric equipment supplied. Die-cut envelope, carton and multiple-up feeder attachments extra.
10x15 Kluge Unit (with 10x15 C. & P. Press)	Skeleton 11x16	11⅛x18	3		1¾" Diam. All Rollers	1 1" Diameter	Disc 16¾ Diameter	None	Short fount. 3" wide. Long fount. 16¾" wide	⅝"	4 Screws	Feeder is standard. Can be hand fed	Up to 12x15	8½"	12"	2400 lbs.	47"x55"	43" width 63½" height	¾ H.P. Motor variable speed control	Electric equipment is extra. Die-cut envelope, carton and multiple-up feeder attachments extra.
12x18 Kluge Unit (with C. & P. Press)	Skeleton 13x19	13⅛x21¾	3		2" Diam. All Rollers	1 1" Diameter	Disc 20 Diameter	None	Short fount. 3" wide. Long fount. 20" wide	⅝"	4 Screws	Feeder is standard. Can be hand fed	Up to 14x18½	8½"	12"	2900 lbs.	55"x60"	46" width 67½" height	¾ H.P. Motor variable speed control	Electric equipment is extra. Die-cut envelope, carton and multiple-up feeder attachments extra.
Kluge Craftsman Unit (with C. & P. Craftsman Press)	Skeleton 13x19	13⅛x21¾	4		2" Diam. All Rollers	2 1" Diameter	Disc 20 Diameter	Adjustable roller tracks	Vibrating brayer. Fountain 20" wide	⅝"	4 Screws	Feeder is standard. Can be hand fed	Up to 14x18½	8½"	12"	3455 lbs.	60"x60"	48½" width 67½" height	1¼ H.P. Motor variable speed control	Electric equipment is extra. Die-cut envelope, carton and multiple-up feeder attachments extra.

*—Controllable and adjustable ink disc and fountain insures proper roller contact and permits regulating amount of ink to suit different areas of form.

MILLER MASTER SPEED PLATEN PRESS

Press Designation	Size of Chase Inside	Size of Platen	Rollers Cov'g. Max. Form	Other Comp. Rollers	Comp. Roller Dimns.	Metal Dist'rs.	Ink Disc or Plate	Roller Adjustment	Fountain	Platen Adjust. Range	Platen Adjustment Means	Feeder	Feeder Sheet Size Limits	Feeder Capacity	Delivery Capacity	Weight	Space Requirements	Press will pass through	Electrical Recommendations	REMARKS
Miller Master Speed	Standard 11x17 Skeleton 11⅛x17⅛	12¼x19¼	4	2 distrs.	Form 1¾ Others 1½	2 Distributors on form rollers. 1 steel vibrating cylinder.	Plate 14⅞x18 7-16	Adjustable roller tracks	Full width fountain	3-16"	5 Screws	Feeder is standard. Cannot be hand fed	3¼x5½ to 11x17	6½"	6½"	3000 lbs.	58"x71½"	48" width 33" stripped 56" height 48" stripped	1½ H.P. to 2 H.P., 1740 R.P.M. variable speed control	Ink Disc is optional. Electric equipment is supplied.

THOMSON-NATIONAL PLATEN PRESSES

Press Designation	Size of Chase Inside	Size of Platen	Rollers Cov'g. Max. Form	Other Comp. Rollers	Comp. Roller Dimns.	Metal Dist'rs.	Ink Disc or Plate	Roller Adjustment	Fountain	Platen Adjust. Range	Platen Adjustment Means	Feeder	Feeder Sheet Size Limits	Feeder Capacity	Delivery Capacity	Weight	Space Requirements	Press will pass through	Electrical Recommendations	REMARKS
Thomson-National Quarto Medium	10x15	10⅛x17⅛	3	3	2" Diam. All Rollers	3 5" and 2"		Different size roller wheels	13¾" wide	.886 to .974	Adjustable eccentric sleeves to	Hand fed only				1673 lbs.	60"x60"	33½" width 45" height	½ H.P. Motor variable speed control	Suitable for embossing, cutting, creasing and other work too heavy for weaker platens. Electric equipment is extra.
Thomson-National Half Medium	13x19	13⅝x25⅝	3	3	2" Diam. All Rollers	3 5" and 2"		Different size roller wheels	17½" wide	.915 to 1.003	Adjustable eccentric sleeves to	Hand fed only				2625 lbs.	72"x72"	42" width 48" height	1 H.P. Motor variable speed control	Suitable for embossing, cutting, creasing and other work too heavy for weaker platens. Electric equipment is extra.
The Colts Armory	14x22	14¼x24 7-16	3	3	2" Diam. All Rollers	3 5", 2" and 2¼"		Different size roller wheels	22½" wide	.928 to 1.041	Adjustable eccentric sleeves to	Hand fed only				3030 lbs.	72"x84"	51" width 50" height	1 H.P. Motor variable speed control	Suitable for embossing, cutting, creasing and other work too heavy for weaker platens. Electric equipment is extra.
The Laureate	14x22	14¼x24 7-16	4	5	2¼" Diam. All Rollers	3 5" and 2¼"		Different size roller wheels	22½" wide	.906 to 1.012	Adjustable eccentric sleeves to	Hand fed only				3585 lbs.	72"x84"	51" width 57" height	1½ H.P. Motor variable speed control	Suitable for embossing, cutting, creasing and other work too heavy for weaker platens. Electric equipment is extra.

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Offset Press Specification Chart

Press Designation	Sheet Size Limits	Maximum Size Print	Minimum Gripper Margin	Plate Dimensions	Plate Thickness	Cut of Plate Cyl.	Blanket Dimensions	Blanket Thickness	Cut of Blanket Cyl.	Speed Range	Feeder	Feeder Capacity	Delivery	Delivery Capacity	Number and Sizes of Covered Inking Rollers	Number and Size of Covered Dampeners	Approximate Weight	Approximate Floor Space	Electrical Specifications
HARRIS																			
17x22 Harris LBB—Single Color	8½x11 to 17½x22½	17½x22½	5-16"	19⅝x23	.010" to .012"	.015"	23⅝x23	.062" to .065"	.075"	Up to 7000	Harris Auto. Suction Pile	[illegible]	Ext. Pile	18"	3 Form 2 9-16" 5 Distrs. 2¼" 1 Ductor 2¼"	2 Dampeners 2¼" 1 Ductor 2¼"	4750 lbs.	4-1"x6-7"	Press: 3 H. P. variable speed motor. Feeder: ¾ H. P. constant speed motor.
21x28 Harris LSN—Single Color	10x14 to 22x30	21½x29	5-16"	24⅝x30	.012"	.015"	26½x30	.062" to .065"	.075"	Up to 6000	Harris Auto. Suction Pile	[illegible]	Ext. Pile	16"	3 Form 3" 5 Distrs. 2½" 1 Ductor 2½"	2 Dampeners 2¼" 1 Ductor 2¼"	8000 lbs.	5-10"x8-8"	Press: 3 H. P. variable speed motor. Feeder: 1 H. P. constant speed motor.
22x34 Harris EL—Single Color	10x14 to 23x36	22½x35	5-16"	25½x36	.012"	.015"	29½x36	.062" to .065"	.075"	Up to 5500	Harris Auto. Suction Pile	[illegible]	Ext. Pile	20"	4 Form 2 9-16" 6 Distrs. 2½" 1 Ductor 2½"	2 Dampeners 3 1-16" 1 Ductor 3 1-16"	10100 lbs.	7-1"x10-7"	Press: 3 H. P. variable speed motor. Feeder: 1 H. P. constant speed motor.
26x40 Harris LSQ—1-Color LSR—2-Color	17x22 to 28½x41	28½x40½	5-16"	32x41	.012"	.015"	37x41½	.062" to .065"	.075"	Up to 5500	Harris HTB Stream Feeder	[illegible]	Ext. Pile	40"	(For each color) 4 Form 3½" 9 Distrs. 3" 1 Ductor 3"	(For each color) 2 Dampeners 3 1-16" 1 Ductor 3 1-16"	1-col. 20100 lbs. 2-col. 40000 lbs.	1-col. 9-7"x19-4" 2-col. 11-6"x23-0"	Feeder: 3 H. P. constant speed motor. Press: 7½ H. P. variable speed motor. Press: 10 H. P. variable speed motor.
35x45 Harris LSS—1-Color LST—2-Color	17x22 to 36x48	35½x47½	5-16"	40x48	.014"	.020"	44x48½	.062" to .065"	.075"	Up to 5000	Harris HTB Stream Feeder	[illegible]	Ext. Pile	40"	(For each color) 4 Form 3½" 9 Distrs. 3" 1 Ductor 3"	(For each color) 2 Dampeners 3 1-16" 1 Ductor 3 1-16"	1-col. 23100 lbs. 2-col. 45700 lbs	1-col. 10-2"x20-0" 2-col. 10-5"x25-9"	Press: 1-col. 7½ H. P.; 2-col. 10 H. P.; variable speed motor. Feeder: 3 H. P. constant speed motor.
42x58 Harris LSJ—1-Color LSK—2-Color LSL—3-Color LSM—4-Color	22x34 to 42x59	41½x58½	5-16"	47½x59	.014"	.020"	52½x59½	.062" to .065"	.075"	Up to 5000	Harris HTB Stream Feeder	[illegible]	Ext. Pile	44"	(For each color) 4 Form 4½" 5 Distrs. 4" 1 Ductor 4"	(For each color) 2 Dampeners 3 1-16" 1 Ductor 3 1-16"	1-col. 34000 lbs. 2-col. 57000 lbs. 3-col. 80000 lbs. 4-col. 103000 lbs.	1-col. 12-3"x23-6" 2-col. 14-4"x27-7" 3-col. 14-6"x30-6" 4-col. 14-4"x35-10"	Press: 1-col. 10 H. P.; 2-col. 15 H. P.; 3-col. 15 H. P.; 4-col. 25 H. P., variable speed motor. Feeder: 3 H. P. constant speed motor. Delivery: 2 H. P. constant speed motor.
46½x68½ Harris LSF—1-Color LSG—2-Color 3-Color LSH—4-Color	25x38 to 46½x68½	46½x68	5-16"	49½x68½	To Customer's Specifications		57x68½	.062" to .065"	.075"	Up to 4500	Harris HTB Stream Feeder	[illegible]	Ext. Pile	49"	(For each color) 4 Form 3½" 7 Distrs. 3½" 1 Ductor 3½"	(For each color) 2 Dampeners 3 9-16" 1 Ductor 3 9-16"	1-col. 45000 lbs. 2-col. 72000 lbs. 3-col. 98000 lbs. 4-col. 125000 lbs.	1-col. 13-1"x26-0" 2-col. 14-4"x31-11" 3-col. 14-4"x36-8" 4-col. 14-4"x42-1"	Press: 1-col. 15 H. P.; 2-col. 20 H. P.; 3-col. 20 H. P.; 4-col. 30 H. P., variable speed motor. Feeder: 3 H. P. constant speed motor. Delivery: 2 H. P. constant speed motor.
HOE																			
30x42" Hoe Single Color Super-Offset Press	17x22 to 32x43	29⅝x42⅝	5-16"	34x43	As specified by purchaser		42x43½	As specified by purchaser		Up to 5000	Dexter	[illegible]	Ext. Pile	38"	4 Form 3½" 5 Distrs. 3½ 1 Ductor 3½"	2 Form 3½" 1 Ductor 3½"	24000 lbs.	19-7"x9-3"	7½ H. P. variable speed control.
41x54" Hoe Single Color Super-Offset Press	19x25 to 42x55½	41½x55	5-16"	45½x55½	As specified by purchaser		54x55½	As specified by purchaser		Up to 4500	Dexter	[illegible]	Ext. Pile	43"	5 Form 3½" 5 Distrs. 3½" 1 Ductor 3½"	2 Form 3½" 1 Ductor 3½"	36500 lbs.	22-10"x11-3"	7½ H. P. variable speed control.
41x54" Hoe Two-Color Super Offset Press	19x25 to 42x55½	41½x55	5-16"	45½x55½	As specified by purchaser		54x55½	As specified by purchaser		Up to 4000	Dexter	[illegible]	Ext. Pile	43"	(For each color) 5 Form 3½" 5 Distrs. 3½" 1 Ductor 3½"	(For each color) 2 Form 3½" 1 Ductor 3½"	69500 lbs.	27-7"x13-0"	10 H. P. variable speed control.
50x72" Hoe One-Color Two-Color Three-Color Four-Color	25x36 to 50x72	49½x71½	½"	54x72½	As specified by purchaser		55x72¼	As specified by purchaser		Up to 5000	Dexter or Christensen	[illegible]	Ext. Pile	50"	(For each color) 4 Form 4½" 7 Distrs. 4½" 2 Ductor 4½"	(For each color) 2 Form 4½" 1 Ductor 4½"	1-col. 52000 lbs. 2-col. 79000 lbs. 3-col. 105000 lbs. 4-col. 132000 lbs.	1-col. 28'8"x14'6" 2-col. 33'8"x14'6" 3-col. 38'8"x14'6" 4-col. 43'8"x14'6"	Press: 1-col. 10 H. P.; 2-col. 20 H. P.; 3-col. 25 H. P.; 4-col. 35 H. P. Feeder: (Electric) 1-col. 3 H. P.; 2-col. 3 H. P.; 3-col. 3 H. P.; 4-col. 3 H. P. Delivery: (Electric) 1-col. 2 H. P.; 2-col. 2 H. P.; 3-col. 2 H. P.; 4-col. 2 H. P.
Hoe Web Offset Presses Built to Customer's Specifications																			
MIEHLE																			
Miehle Offset No. 60	24x24 to 42x58	41⅝x58	⅜"	47½x59	.020"	.020"	48x59½	.062" to .063"	.080"	Up to 5200	Dexter	[illegible]	Pile	44"	4 Form 3½" 4 Form Riders 3½" 3 Drum 2¾" 1 Ductor 3½"	2 Form 3½" 1 Ductor 3½"	1-col. 32500 lbs. 2-col. 56000 lbs. 3-col. 80000 lbs. 4-col. 103000 lbs.	1-col. 22-7"x12-8½" 2-col. 27-9"x12-8½" 3-col. 32-11"x12-8½" 4-col. 38-1"x12-8½"	1-col. 10 H. P. 2-col. 20 H. P. 3-col. 30 H. P. 4-col. 40 H. P.
Miehle Offset No. 69	24x34 to 46½x67½	46x67	½"	50x68	.020"	.020"	51x68	.062" to .063"	.080"	Up to 4500	Dexter	[illegible]	Pile	44"	4 Form 3½" 4 Distributors 3½" 3 Drum 2¾" 1 Ductor 3½	2 Form 3½" 1 Ductor 3½"	1-col. 37000 lbs. 2-col. 65000 lbs. 3-col. 102000 lbs. 4-col. 134000 lbs.	1-col. 25-4"x13-5" 2-col. 31-4"x13-5" 3-col. 37-4"x13-5" 4-col. 43-4"x13-5"	1-col. 10 H. P. 2-col. 20 H. P. 3-col. 30 H. P. 4-col. 40 H. P.
NEW ERA New Era Multi-Color Web Offset Press Built to Customer's Specifications																			
RUTHERFORD 20x26"	20x26	19½x25	¼"	22½x27	.012"	.012"	27x25	.062"	.075"	Up to 6000 close register 5000	Rutherford Suction Pile	[illegible]	Receding Auto Pile	18"	3 Form 2 7/16" 7 Distributing 2⅛" 1 Distributing 2 7/16" 1 Ductor 2⅛"	2-2½" diam. Damp. 1-2½" diam. Ductor	8800 lbs.	4-8"x9-6"	3 H. P. Press 1½ H. P. Feeder
Rutherford 20x29"	20x29	19½x28	¼"	22½x30	.012"	.012"	30x25	.062"	.075"	Up to 6000 Close register 5000	Rutherford Suction Pile	[illegible]	Receding Auto Pile	18"	3 Form 2 7/16" 7 Distributing 2⅛" 1 Distributing 2 7/16" 1 Ductor 2⅛"	2-2½" diam. Damp. 1-2½" diam. Ductor	9300 lbs.	5-1"x9-6"	3 H. P. Press 1½ H. P. Feeder
WEBENDORFER 12x18" P	5x8 to 14x18	13¼x17⅝	3-16"	17x18	.009"	.015"	18⅛x16½	3 Ply	.071"		Webendorfer Vacuum Air	[illegible]	Chute Optional Chain Auto Pile	6" 18"	2 Forms 2⅜" 3 Distrs. 1 Ductor 1 Large Drum 3 Riders	2 Plate 2¼" 1 Ductor 2¼"	1500 lbs.	3-2"x4'	⅛ H. P.-⅛ H. P.
Webendorfer 17x22" Mae	8x10 to 17½x22½	17x22	3-16"	19⅝x22⅝	.012"	.015"	22⅝x21½	3 Ply	.071"		Webendorfer Vacuum Air	[illegible]	Chain Auto Pile	18"	3 Form 2½" 8 Distrs. 2" 1 Ductor 2" 3 Drums	2 Plate 2⅛" 1 Ductor 2¼"	3600 lbs.	3-9"x5-1"	⅛ H. P.-1½. H. P. variable speed control.
Webendorfer 22x29" BA	22x29	21x28	5-16"	24⅛x28½	.012"	.015"	26x28⅝	3 Ply	.071"		Webendorfer Vacuum Air	[illegible]	Chain Auto Pile	23"	4 Form 2½" 6 Distrs. 2" 3 Drums 1 Ductor 2"	2 Plate 2¼" 1 Ductor 2⅛"	6200 lbs.	6'x7'-5"	1 H. P.-3 H. P. variable speed control.
Webendorfer 26x40" BC	17x22 to 26x40	25⅝x40½	5-16"	30½x40⅝	.012"	.015"		3 Ply	.071"		Webendorfer Vacuum Air		Optional Chain Auto or Extension Pile		4 Form 3" 7 Distrs. 2½" 5 Drums 1 Ductor 2½"	2 Forms 3¼" 1 Ductor 3¼"	10,000 lbs.	84"x144"	1 H. P.-5 H. P. variable speed control.
Webendorfer Multi-Color Web Offset Press Built to Customer's Specifications																			
WILLARD 22x30"	11x17 to [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.017" or [illegible]	[illegible]	[illegible]	[illegible]	Up to 6500 close regis-	Willard Reloading Suction	[illegible]	Receding Auto Pile 4 sets patented spring	27"	4 Form 2⅛" 1-7" Drum 3-3½" Drums 5 Distributors 2¼" 1 Ink Ductor 2¼"	2 Plate 2¼" 1 Ductor 2¼"	7000 lbs.	5'x8'	3 H. P. Press. 1 H. P. Blower.

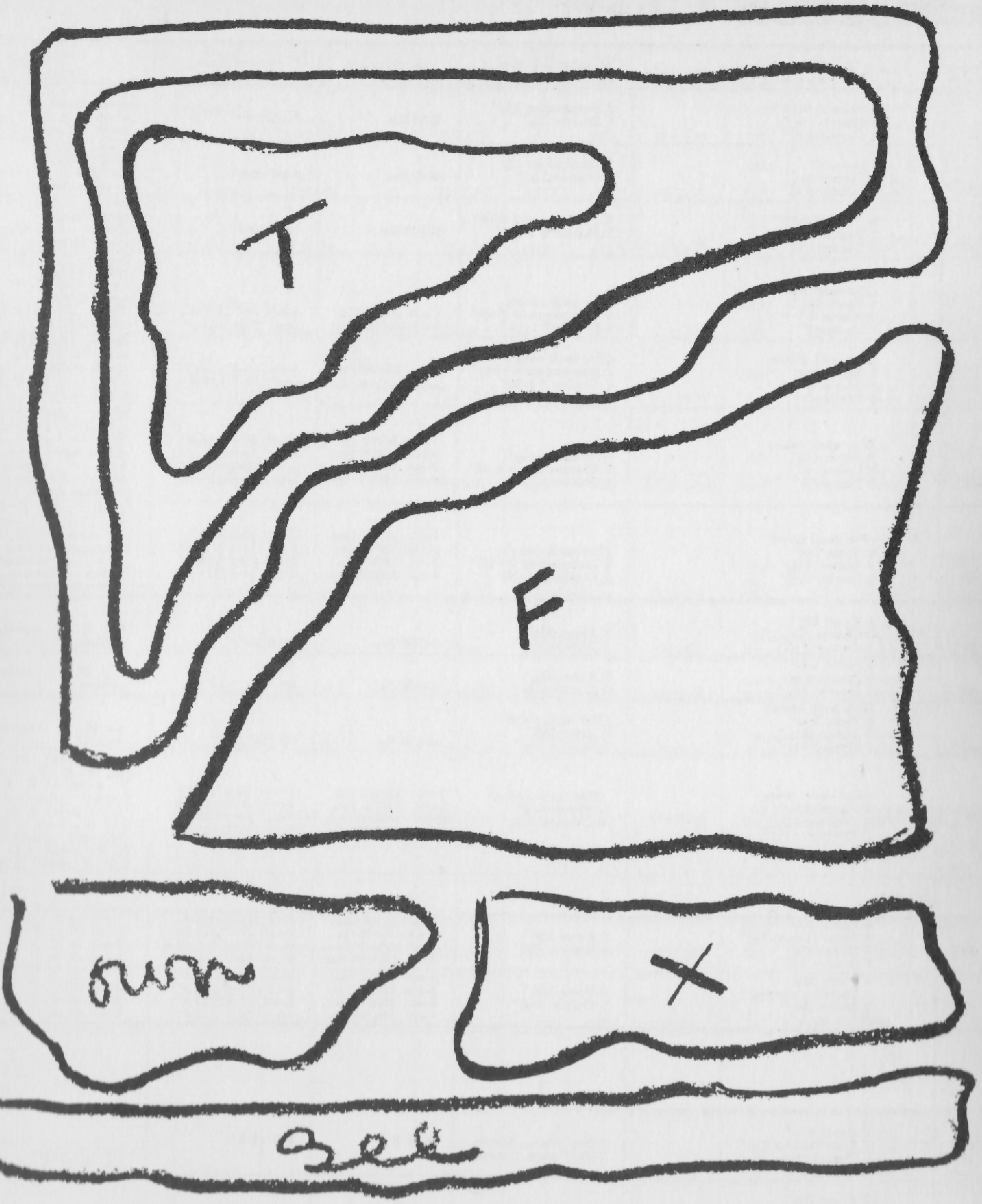

Illustration 26

Pressman's Symbols for Spot-Up Make-Ready Overlay

All pressmen instruct feeders to use a certain paper stock for patch-up work. The following symbols indicate any change from the pressmen's instructions:

T—indicates tissue paper is wanted.
F—indicates folio paper is wanted.
X—indicates cut out all area inside mark.
O—or own indicates a piece of its own stock, generally meaning the stock on which the overlay is being marked out and made-ready.
See—Is a reminder to the pressman to investigate the cause of the trouble.

TOPICAL INDEX

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